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ABSTRACT

The study examined effects of training older siblings (ages 6-8) of six 1- to 3-year-old infants and toddlers with Down syndrome to employ social communication strategies in play sessions. Three secondary purposes included evaluating effects of intervention upon the communication skills of the Down syndrome children, effects of intervention on interactions with mothers when playing with their Down syndrome children, and evaluation of parent perceptions of interventions with siblings. Baseline, intervention, and follow-up phases were employed. Intervention was delivered over six sessions in the context of familiar games (e.g., ball play, blowing bubbles, peek-a-boo), employing procedures which included modeling with puppets in a series of six videotaped segments, verbal instruction, role playing, and social reinforcement. Results indicated that older siblings consistently increased contingent responses to younger siblings' nonverbal turns. Increased communication of younger siblings was observed in higher frequency of spontaneous comments and more response to turns by older siblings. Younger siblings did not, however, increase initiated turns as a result of intervention with older siblings. Contingent responses by mothers measured before and after intervention did not indicate changes related to the intervention by older siblings. Parents reported they observed a moderate level of change in the interactive play of their children. (JW)

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Siblings as Communication Trainers for Prelinguistic Infants with Down Syndrome

by

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of the requirements for the degree of

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Abstract

SIBLINGS AS COMMUNICATION TRAINERS FOR
PRELINGUISTIC INFANTS WITH DOWN SYNDROME

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Descriptive studies of interaction with handicapped children have been primarily restricted to mother-child dyads. Intervention models have been developed and applied to promote mothers' responsiveness to their handicapped children. Siblings of handicapped children have received attention in the literature but descriptions of interaction between nonhandicapped and handicapped siblings are limited. In addition to the need for descriptive information regarding sibling dyads when one member is handicapped, the feasibility of intervention to promote responsive interaction requires empirical support. In this study, social communication strategies (SCS) were taught to older siblings of children with Down syndrome. Six sibling dyads participated in a single-subject, multiple baseline design. Two primary purposes of the study were 1) to observe the responsiveness of older, nonhandicapped siblings (OSs) to younger, handicapped siblings (YSs) prior to intervention and 2) to determine the effectiveness of SCS intervention to promote the responsiveness of OSs to YSs. Three secondary purposes were to determine the effects of SCS intervention on YSs' communication behavior, responsivity of mothers to YSs and parents' perception of intervention. Six families volunteered to participate in the study with OSs between 6 and 8 years of age and YSs

between 16 and 41 months of age. The study was conducted in families' homes. Following weekly baseline observations, varying from 2 to 4 weeks, OSs received six sessions of intervention. SCS intervention, designed to teach the concepts, follow the leader, take turns and change-a-little, was implemented through videotaped puppet presentations, verbal instruction, role-play and coaching during play sessions. Follow-up probes occurred at one and three weeks following intervention. Measures of sibling responsivity, taken from videotaped samples, were used to evaluate general responsivity, contingent response, turn types, turn balance and turnabouts of OSs. Baseline data revealed that five OSs responded contingently to nearly half of YSs' turns. Following intervention, a consistent treatment effect to increase OSs' contingent response to criterion levels of .70 or above was observed. Further, increased percentages of contingent response by OSs were related to responsive, rather than initiated turns of YSs. Secondary measures of YSs' communication behavior, mothers' responsiveness and parents' perceptions of SCS intervention were made. Observational measures of YSs' communicative intents and modality showed increased use of spontaneous comments for six subjects, positive changes in elicited requests for three subjects and increased complexity of gaze, gesture and vocalization for three subjects. Three mothers participated in probes of responsivity at baseline and follow-up. Changes in mothers' contingent response to their children with Down syndrome were not observed. High percentages of contingent response were observed in both baseline and follow-up probes for three mothers. Parents were asked to complete a questionnaire following the

study. Responses suggested that parents perceived a "moderate change" in sibling interaction related to SCS intervention. The results of this study demonstrated the effectiveness of SCS intervention to promote responsiveness of nonhandicapped to handicapped siblings. Direct intervention with older siblings indirectly contributed to positive increases in the communication behavior of younger, handicapped siblings. These findings have the potential of application for families with young, handicapped children. Further research is needed to examine appropriate intensity and duration of such interventions.

TABLE OF CONTENTS

	Page
List of Figures	v
List of Tables	vi
Chapter I: Introduction	1
Statement of the Problem	1
Prelinguistic Skills of Handicapped Infants	2
Caregivers of Handicapped Infants	3
Sibling Interaction	4
Purpose of This Study	5
Definitions of Terms	6
Chapter II: Review of the Literature	9
Development of Intentional Communication	10
Social and Cognitive Bases of Communication	13
Intentional Communication Associated with Down Syndrome	18
Mother-Child Interaction	29
Siblings of Handicapped Children	35
Interaction Between Nonhandicapped Siblings	36
Interactions with a Handicapped Sibling	39
Evaluating Intervention with Siblings	41
Summary and Questions Investigated	42

Page

Chapter III: Method 48
Subjects and Settings 48
Intervention Procedures 55
Phases of the Study 56
Design of the Study 59
Phase Length and Changes 60
Measurements 61
Interobserver Reliability 66
Trend and Level Analysis of Individually Graphed Data 69
Chapter IV: Results 73
Responsiveness of Older Siblings 73
Communication Behavior of Younger Siblings 91
Mothers' Responsiveness to Younger Siblings 102
Parent Evaluation of the Study 107
Chapter V: Discussion 110
Question 1 110
Question 2 117
Question 3 125
Question 4 131
Question 5 134
Limitations of the Study 136
Summary and Future Directions 142
References 148

Page

Appendices 155

Appendix A: Scripts for Puppet Modeling 155

Appendix B: Verbal Instruction scripts 187

Appendix C: Nonverbal Turn-taking Codes 192

Appendix D: Communication Modality 197

Appendix E: Spontaneous Comments/Requests 201

Appendix F: Elicited Comments/Requests 204

Appendix G: Parent Evaluation Questionnaire 207

Vita 211

LIST OF FIGURES

Number		Page
1.	Percentages of Responsive Turns by Older Sibling in Dyad 1	74
2.	Percentages of Contingent Responses by Older Siblings	77
3.	Older Siblings' Responses to Younger Siblings Turn-Types	84
4.	Proportion of Turns by Older and Younger Siblings	88
5.	Frequency of Turn-Abouts for Older Siblings	89
6.	Frequency of Comments for Young Siblings	92
7.	Frequency of Requests for Young Siblings	93
8.	Combined Frequency of Communicative Intents for Younger Siblings	95
9.	Mean Frequency of Turn-Types for Younger Siblings	101
10.	Proportion of Turn-Balance in Mother-Child and Sibling Dyads 2, 4, 5	105

LIST OF TABLES

Number		Page
1.	Gender and Ages of Subjects	50
2.	Results of Assessment with the Ordinal Scales of Psychological Development for Young Siblings	55
3.	Multiple Baseline Design for Six Sibling Dyads	61
4.	Mean Numbers of Turns by Older and Young Siblings	86
5.	Development Scoring for Elicited Comments and Requests for Younger Siblings	97
6.	Communication Modality Scores	99
7.	Percentage of Contingent Response by Mothers to Young Siblings	103
8.	Frequencies of Turns for Mother-Child and Sibling Dyads. . .	104
9.	Frequency of Turnabouts for Mothers and OSs	106
10.	Parent Evaluation of SCS Intervention with Older Nonhandicapped Siblings	109

CHAPTER I

Introduction

Statement of the Problem

Before language, infants master a range of skills that include the ability to get attention and to initiate interaction with caregivers. These prelinguistic skills are called intentional communication and are strongly related to language development (Bates, Benigni, Camaioni & Volterra, 1979). Infants' intentional acts toward caregivers emerge at about 9 months of age and are observed in prelinguistic forms of gaze, gesture and/or vocalization (Bates et al.). Caregivers' responses to intentional acts of infants contribute to the increased coordination of gaze, gesture and vocal behavior (Dore, 1983; Golinkoff, 1983). In the context of social interaction, normally developing infants experience frequent opportunities to develop intentional communication.

Handicapped infants, in addition to expected delays in communication development, experience fewer opportunities for communication development. Handicapped infants are reported to exhibit weaker communicative signals, leading to less responsive interaction from caregivers (Brooks-Gunn & Lewis, 1984; Buckhalt, Rutherford & Goldberg, 1978; Field, 1983). Recognizing the importance of prelinguistic communication and the importance of social interaction, professionals in early intervention have become increasingly focused on the parent-child dyad. While support for the parent-child dyad is certainly needed, siblings offer a source of frequent communicative opportunities for handicapped infants. The sibling dyad is rarely addressed in early intervention and reports of systematic intervention are limited.

Prelinguistic Skills of Handicapped Infants

Robust relationships have been reported between preverbal communication and emergent language (Bates et al., 1979; Bruner, 1975; Dore, 1983, Harding & Golinkoff, 1979; Ratner & Bruner, 1978). Related to research examining prelinguistic skills of normally developing infants, investigators have begun to study the preverbal forms and functions of infants at risk for communication/language delay. Infants with Down syndrome have been hypothesized to exhibit quantitative delays in language related to general developmental delay (Motti, Cicchetti & Sroufe, 1983). Studies of the prelinguistic skills of infants with Down syndrome have described limited coordination of gaze, gesture and vocal behaviors that explain, in part, communication delays observed in this population.

Studies focusing on intentional communication in infants with Down syndrome use different terminology such as coordinated communication acts (Bricker & Carlson, 1980) and interpatterned acts (Dunst, 1980) that are roughly equivalent to intentional acts. When compared to non-handicapped infants on the basis of developmental age, infants with Down syndrome were not only delayed in their use of intentional communication, but specific difficulties in the coordination of gaze, gesture and vocalization were observed (Bricker & Carlson, 1980). Related findings were reported by Gunn, Berry and Andrews (1979 1982) who reported that infants with Down syndrome remained focused in face-to-face interactions longer than nonhandicapped infants of the same chronological age. Krakow and Kopp (1983) observed limited gaze switching between objects and adults in Down syndrome infants. In

addition to difficulties in the coordinated use of intentional acts, infants with Down syndrome have been reported to demonstrate fewer attachment behaviors than nonhandicapped infants. Infants with Down syndrome do not discriminate between familiar and unfamiliar adults in prelinguistic communicative acts (Bricker & Carlson, 1980). Dore (1983) has suggested that differences in attachment and perception between infants with Down syndrome and nonhandicapped infants contribute to more limited communicative interactions for Down syndrome infants. These findings emphasize some of the variables that contribute to the delay of intentional communication found in infants with Down syndrome.

Caregivers of Handicapped Infants

Interaction with caregivers is considered to be an important factor in the social bases of language development for nonhandicapped infants. Mothers of infants with Down syndrome talk more frequently while their infants socialize less (Buckhalt et al., 1978). The differences in social interaction between mothers of infants with Down syndrome and mothers of nonhandicapped infants apparently increase with development as a result of interaction. That is, infants with Down syndrome vocalize less frequently and thus experience fewer contingent interactions with caregivers. As a result, caregivers reportedly vocalize more frequently in an attempt to stimulate less responsive infants (Field, 1983). A pattern of less contingent interactions between caregivers and infants with Down syndrome may result.

The need to support parent-infant interactions when an infant is handicapped were addressed in intervention models proposed by MacDonald

and Gillette (1984) and Mahoney and Powell (1984). Their interventions focus on parent-implemented strategies with infants at-risk for communication and language delays. A primary goal of parent education, in the context of social interaction with their handicapped infants, is to balance turn-taking so that reciprocal interaction can take place. While several authors indicate the importance of early intervention with parent-infant dyads when infants are handicapped, efficacy data for such intervention models is limited. Some recent empirical support for coaching mothers to respond to their handicapped infants' communication signals was provided in a recent study by Sandall (1986). Mothers in Sandall's study showed increased bids for further interaction to their infants.

Sibling Interaction

Beyond the parent-infant dyad, interaction with brothers and sisters contributes a social context for the development of communication skills. Older siblings have been called "socialization agents" for younger siblings. When an infant is born with a handicap, the sibling subsystem in a family may become more vulnerable in a way similar to the parent-infant subsystem (Crnic & Leconte, 1986). Family theorists who subscribe to a "systems" orientation have described the importance of balanced give-and-take in various family subsystems (Minuchin, 1985). Older siblings of handicapped infants may not experience the development of balanced interaction with the younger sibling.

Intervention studies with siblings as training agents for younger handicapped siblings have achieved some success when the task is

structured and made clear to the older sibling (Cicirelli, 1975). However, the efficacy of siblings to facilitate communicative interactions with handicapped infants in familiar games has not been investigated. Intervention models designed to foster the interactive skills of older siblings in play interactions with handicapped infants are needed to extend the context of professional support for families. In addition, empirical studies regarding the facilitative effect of such interventions on the communication development of handicapped infants are needed.

Purpose of This Study

The primary purpose of this study was to examine the effects of training older siblings of infants and toddlers with Down syndrome to employ social communication strategies in play sessions. The percentage of responsive turns by older siblings in play sessions with their younger, handicapped siblings was charted across three phases including baseline, intervention and follow-up, lasting approximately twelve weeks. There were three secondary purposes. The first was to evaluate the effects of intervention upon the communication skills of the younger child with Down syndrome. The frequency and quality of prelinguistic communication behaviors of younger siblings were evaluated in spontaneous and elicited conditions. The second was to examine the indirect effect of intervention on interactions with mothers when playing with the child with Down syndrome. Observational probes were collected periodically throughout the study for this purpose. A final purpose was to evaluate parents' perceptions of intervention with siblings. Parent evaluation was accomplished with a

questionnaire sent to parents upon the completion of the study. The specific research questions will be provided, following an examination of the research literature.

Definition of Terms

Terms used frequently in literature describing developing communication in nonhandicapped and handicapped populations of young children are defined below. Definitions provided here apply to terms used in the following chapter.

Contingent Interaction. Parents frequently respond to their infants' smiles, burps, and coos immediately and attempt to interpret their meaning (Snow & Ratner, 1984). Parental responsiveness, in terms of immediacy and relatedness, has been called contingent. Contingent responses by caregivers to infants' signals provide experiences leading to the development of contingent interaction. Early in life, parents respond to infants' cues. As infants learn their effect upon parental behavior, they also learn to respond contingently to parents' cues.

Dyad: Two individuals engaged in joint activity for a given period of time form a dyad. Mother-child dyads are the most common ones studied.

Initiated Communication. The act of beginning a communicative exchange is defined as an initiation. Communication begins as a responsive act for nonhandicapped infants, but quickly becomes initiated when smiling at parents results in cycles of games and social interaction. Handicapped infants exhibit less initiated communication related to less frequent and more subtle communication signals.

Intentional Communication. The exact time when infants' communicative signals become intentional is not clearly pinpointed. Investigators agree that infants begin to act purposefully and persistently to direct the attention or behavior of caregivers sometime near the first birthday. The ability to express intents through coordination of vocal, gestural and gaze behaviors to caregivers is related to the emergence of language (Bates et al., 1979).

Prelinguistic Communication. The period of time prior to language development is referred to as preverbal, nonverbal, or prelinguistic. The term prelinguistic most accurately describes the processes taking place before the emergence of recognizable linguistic forms.

Protodeclarative/Comment. Observations of infant communication at the intentional stage indicate several functions exist at this level. Bates et al. (1979) observed infants' signals which direct adult attention to specific objects or actions with objects, calling these protodeclaratives. Coggins and Carpenter (1981) and Coggins, Olswang, & Guthrie (in press) have called these behaviors commenting. In this study, the term comment will be used to include protodeclaratives.

Protoimperatives/Request. Protoimperatives were defined by Bates et al. (1979) to include the child's use of gesture, gaze or vocalizations to cause adults to act. Persistent signalling to engage adult cooperation is referred to as both protoimperative and request by Bates et al., Snyder et al. (1980), Coggins and Carpenter (1981) and Coggins et al., (1985). In this study, the term request will be used.

Sensorimotor stages: Cognitive development through the first year and into the second is considered to be the sensorimotor period,

according to Piagetian theory. This period is characterized by the infant's development of skills to obtain attention/objects and to invent action routines with people/objects. This period is further divided into six stages of development, with stages IV and V corresponding to the emergence of intentional communicative acts (Harding & Golinkoff, 1979).

Social Communication Strategies (SCS). Intervention models developed by MacDonald and Gillette (1984) and elaborated by Mahoney and Powell (1984) employed conversational strategies hypothesized to facilitate further interaction and communication for handicapped infants and preschoolers. Three main strategies have been taught to parents and caregivers: follow the leader, take turns and elaborate. Balanced interactions between adults and child result from the use of SCS and give more opportunities for young children to initiate communication.

Turn Taking. A turn is defined as any single communicative act, verbal or nonverbal that is directed toward another person. Turn taking is considered one of the primary social interaction skills normally learned in infancy. Parents initially take more turns and infants gradually take a more active role in social games and routines. Turns between parents and nonhandicapped infants become more balanced as each partner learns to respond contingently to the other.

CHAPTER II

Review of the Literature

Communication and language development occur in interactive contexts. Recent research in the area of prelinguistic communication of infants has described the social influences on emergent language forms. Studies of normally developing infants have supported the view that cognitive and social skills combine to form the basis of intentional communication near the first birthday (Bates et al., 1979).

For an infant born with Down syndrome, cognitive development is generally delayed. Related to delayed development, infants with Down syndrome are reported to exhibit more subtle communicative signals such as brief face-to-face gaze in early life (Snow, in press). Characteristics of handicapped infants such as limited vocalization and longer response time contribute to differences in mothers' responses when compared to mothers of nonhandicapped infants. Investigators have reported that mothers of infants with Down syndrome are more talkative and less contingent in timing and semantic content of their responses when compared to mothers of nonhandicapped infants (Buckhalt et al., 1978; Mahoney, 1983; Peterson & Sherrod, 1982; Smith & Hagen, 1984). In this chapter, the cognitive and social characteristics of infants with Down syndrome are examined.

Before discussing children with Down syndrome, a brief overview of intentional communication and related cognitive and social skills is provided. Following a normative model, studies of children with Down syndrome are reviewed. Then, characteristics associated with Down syndrome and their effect on communicative interactions in mother-child

dyads are analyzed. From the parent-child dyad, discussion shifts to sibling dyads and the need for intervention with siblings of handicapped children is demonstrated.

Development of Intentional Communication

The notion of intentional communication has received considerable attention in recent literature that examines emerging linguistic forms in nonhandicapped children. Between the ages of 8 and 12 months, infants combine social and cognitive skills in purposeful communicative acts toward caregivers. This period has been referred to as the "age of intent" (Bates et al., 1979). Infants rapidly change from gestural and vocal signals to vocalizations called phonetically consistent forms or vocables. An example of early intentional communication was provided in descriptions by Halliday (1979) of his son Nigel. Between the ages of 8 to 10 months, Nigel used gestural (pointing) and vocal (d) signals to direct adult attention to particular objects. Halliday's record of Nigel's prelinguistic forms and functions illustrated the changes in communication just prior to language (first words). Studies of normally developing infants in the latter part of the first year of life have substantiated Halliday's descriptions of his son.

Harding and Golinkoff (1979) observed 46 firstborn infants with a mean age of 10.7 months. Although the sequence of intentional communication was not the main question investigated, infants in their study demonstrated the following sequence of intentional signalling: 1) initiation of eye contact, 2) looking back and forth between mother's eyes and hands, 3) looking back and forth between mother's

eyes, hands and object. Because their study was not longitudinal, these findings only describe one changing element, that of gaze patterns. Bates et al. (1979) offered more elaboration beyond initial gaze patterns which are summarized.

1. Gaze: Alternate between goal and adult while signalling. Not a lasting phenomenon, continue to "check" with parent if not immediately succeeding in communication.
2. Sequencing and substitution: Add gesture, vocalization contingent upon adult behavior.
3. Ritualize signals: Gestures and sounds become ritualized and more conventional forms of communication emerge.

Recent findings by Harding (1984) support the interaction of preverbal behaviors of gaze, gesture and vocalization. Observations of 12 infants between the ages of 6 and 11 months showed a consistent sequence for 11 of the 12 infants as follows:

1. Instrumental behaviors: Achieve toy through touching adult.
2. Intentional gestures: Reach, look back-and-forth from object to adult.
3. Intentional vocalizing: Vocalization and looking combined.
4. Coordinated patterns: All three behaviors to convey intent.

Coordination among prelinguistic behaviors may be a key element in the transition to verbal forms. A critical point in the sequence of intentional communication development reported by Halliday (1979), Bates et al. (1979), Harding (1984) appears to be the coordination of prelinguistic signals within familiar communicative contexts. Dore (1983) described a similar event in samples of dialogue in

infant-mother dyads. Vocalizations became more conventional as infants repeated or protested in response to mother's signals.

In studies by Bates et al. (1979) with 25 infants between 9.5 and 12.5 months, various categories of gestural and language behaviors were found to be correlated in a limited way. This finding was interpreted as an indicator that the two domains developed separately. Specific gestural behaviors significantly related to language were giving, showing, communicative pointing and ritual requests. Communicative pointing was found to be the strongest predictor of language development. Language measures included comprehension, non-referential speech acts and true naming. Consistent refinement of gestural, vocal and verbal forms of communication were reported by Bates et al. (1979), as reported in Halliday's observations of Nigel. What Bates et al. (1979) did not find was a gradual replacement of gestures by vocal and verbal forms as described by Halliday (1979).

Descriptions of intentional communication in normally developing infants differ. Descriptions by Halliday (1979) and studies by Harding and Golinkoff (1979) presented a view that gaze, gesture and vocal forms are gradually replaced by words. Bates et al. (1979) did not find a gradual replacement taxonomy in her study. Investigators do agree that intentional communication represents a period of rapid transition to language for normally developing infants. Social and cognitive skills as they contribute to intentional communication are discussed next.

Social and Cognitive Bases of Communication

Social Bases. The role of parental response during early social interchanges with babies has been a critical influence on the infant's subsequent communicative attempts. Snow (1972) has hypothesized that learning to signal adults is dependent on having experienced contingent responses from caregivers early in life. Many variables have been studied in mother-child dyads, including characteristics of mothers and infants. Through observational research, interaction between mother and child has been analyzed to determine the probabilities of certain responses from parents.

Observers of reciprocal interaction between mother and child report a variety of strategies used by infants and parents to initiate, to maintain and to terminate sequences of interaction (Brazelton et al., 1974). Most notable in work of Brazelton et al. was the individual variation reported in maternal attempts to evoke responses from their infants. These included differences in specific behaviors, intensity, tempo and repetition of mother's stimuli. Differences in the "synchrony," or the degree to which mother-infant dyads operated in the same rhythm with one another, appeared related to maternal sensitivity to the infant's state of readiness to communicate. Sensitivity of parental response or contingency in relation to the infant's state (readiness) and overt signals lead infants to expect that particular behaviors will be effective again. Expectancy of parental response leads to exploration and practice of new skills.

As infant attention to parents becomes increasingly focused, infants appear better equipped to control social interchanges. Brazelton et al. (1974) described cycles of 6-week-old infants in which infants initiated interaction by slowly turning head toward mother, visually focusing attention, smiling and building physical activity to a peak of excitement, often vocalizing and then decelerating and turning away. At a later stage, Bruner (1974) reported observations of four-month-old infants signalling that fatigue points were reached for particular social routines through gesture and crying.

Bruner (1974) cites other evidence of nonverbal communicative signals in four-month-old infants who vocalized on waking, calling for parent attention with distinct voicing patterns. Other communicative behaviors included annoyance at not being able to reach an object, expressed through fussing, and infants following an adult's line of visual regard when looking toward an object. Development of joint visual regard and combined visual regard with gestures toward objects led Bruner (1974) to describe the period between four and nine months as a period of development for increased control in joint and selective attention by the infant.

Reciprocal communication between infant and parent appears to be a means of practicing vocal, gestural and visual communicative signals prior to the coordinated use of these behaviors. Warren and Rogers-Warren (1982) trace the early roots of communicative intent to "early prelinguistic interactional patterns which are prototypes for later communicational exchange." Mutual attention, joint action, turn-taking and accommodation between participants, practiced in early games such

as peek-a-boo, are described by Ratner and Bruner (1978). Nonverbal interchanges appear to become more intentional on the infant's part, as the infant begins to anticipate parental turns in games through bodily excitation. The infant may later initiate games and routines through gestures, vocal and visual behaviors. The development of intentional control appears related to burgeoning cognitive skills which is discussed next.

Cognitive Bases. Bates et al. (1979) stated that the "onset of communicative intentions and conventional signalling occurs around 9-10 months of age for most infants." She and her colleagues further proposed that certain cognitive developments precede the emergence of purposeful communicative acts, taking an approach based on theories of Piaget. Intentional acts are viewed as solutions to tasks that are made possible by preceding sensorimotor accomplishments of infants. Results of her extensive correlational study will be discussed.

Bate's (1979) work is interpreted to support a strong predictive relationship between certain aspects of cognitive development and language including means-end relations, imitation, combinatorial play and symbolic play. It is important to note, as Bates emphasized, that these correlational patterns change with development. Specific cognitive developments appear to play a greater or lessor role in communication development according to the specific communication skill measured.

Harding and Golinkoff (1979) offered a more stage related cognitive interpretation for intentional acts. In their study, 46 infants between sensorimotor stages V and VI were determined to be

using nonverbal means of communicative intent. Intentional communicative acts of infants at a lower cognitive stage were not observed to be using and were labelled as perlocutionary (nonintentional acts). Infants in the latter two stages were found to be performing cognitive tasks at stage IV and V, leading Harding and Golinkoff (1979) to conclude a prerequisite relationship exists between cognitive development and intentional communication. Bates (1979) referred to the emergence of intentional acts as coinciding with cognitive developments of means-end sequences using objects, which are said to occur in sensorimotor stage IV. In Piaget's terms, stage IV is referred to as "tertiary circular reactions" and "the invention of novel means to familiar ends." According to Bates (1979) "the relatively sudden onset of intentional, conventional communication around 9 months seems to be related to some other developments in "learning how to get things done in the world." Beyond looking at parallels in cognitive and communication development, intentional acts appear to combine cognitive, social and communicative skills.

Bruner (1983) refers to more or less "firm" conclusions about cognitive development in prelinguistic infants which contribute to language development. Goal directed activity of infants is mentioned as one of the very first to emerge and to expand. Bruner (1983b) attributes four cognitive "endowments" as bearing the weight of unique communicative acts. These include means-end readiness, transactionality, systematicity, and abstractness. Language development is considered by Bruner to require its own rules and problem-solving.

Returning to the results of Bates et al. (1979), we can find support for her original theoretical position which proposed specific relationships between cognitive and communication development. The term, "local homologies" is used by Bates to predict skill-specific relationships in contrast to an orthodox Piagetian view. As mentioned earlier, only four of nine cognitive measures were shown to be related to communication; means-end, imitation and various aspects of play. The lack of predictive relationships between cognitive domains alone indicate these areas predict communication in different ways and at different times. As Bates suggests, it appears that different cognitive elements may be correlated to language development at given times in development. In relation to intentional communication development, it appears means-end is the strongest predictor. Strong correlation between means-end and communicative gestural complex are reported in addition to nonreferential and referential words.

It is apparent from Bates' discussion that intersession correlations were not performed between cognitive and communicative measures. Bates herself argues that correlational predictions from earlier to later points of development between domains offer important information regarding the continuity of development. For example, correlations between means-end in session A and referential vocabulary in Session D would offer more insight regarding the significance of using adults as agents, or the role of intentional communicative acts to predict later language acquisition. A final note of interest on this subject is that means-end correlated equally with nonreferential and referential vocabulary. If referential acts which occur in a communicative setting

are not uniquely correlated to means-end skills, it follows that much means-end development does not appear restricted to a communicative setting. In other words, intentional acts may have a cognitive basis but are not restricted to communicative acts. Intentional communication may represent a relatively short period of development in which means-end taks are solved by prelinguistic, intentional communicative acts.

For normally developing infants, social and cognitive developments in the first year provide the bases for intentional communication. While individual differences are reported, the intentional period is a critical transition time when increasingly complex communicative forms are practiced and refined with caregivers. From a normative model, the discussion shifts to the differences found in the prelinguistic development of children with Down syndrome.

Intentional Communication Associated with Down Syndrome

Perhaps the most well known characteristic of Down syndrome is the cognitive delay exhibited by individuals with this biologically based disability. Characteristics of infants with Down syndrome discussed in the literature indicate that social and cognitive development is both delayed (Greenwald & Leonard, 1979) and different (Dunst, 1980) compared to nonhandicapped infants. In addition to cognitive delays, group differences in temperament (Rothbart & Hanson, 1983), gaze, gesture and vocalization are reported (Gunn, Berry & Andrews, 1979/1982; Krakow and Kopp, 1983). Investigators have reported that these differences are consistent with the delayed cognitive development of infants with Down syndrome. Because certain cognitive and

communication skills are reported to be related in populations of nonhandicapped children, investigators have attempted to determine if similar relationships exist for children with Down syndrome. Studies that examined the relationships between cognitive development and communication development in children with Down syndrome are discussed first.

Researchers have applied normative model of cognitive development to Down syndrome infants when assessing prelinguistic development. The attainment of sensorimotor stage IV and V has been related to the emergence of intentional communication in normally developing infants (Bates et al., 1979; Harding & Golinkoff, 1979). Infants with Down syndrome are also reported to exhibit intentional communication and concurrently perform at sensorimotor stages IV and V (Greenwald & Leonard, 1979).

Greenwald and Leonard compared the performance of infants with Down syndrome and nonhandicapped infants, matched on the basis of cognitive stages. Subjects in both groups performed at the stage IV and V level, as assessed with the Ordinal Scales of Psychological Development (OSPD) (Uzgiris & Hunt, 1975). An analysis of sensorimotor stage and developmental scores on Snyder's elicitation tasks (Snyder, 1978) showed a significant difference that favored stage V subjects. Both nonhandicapped and Down syndrome subjects at stage V had higher developmental scores on elicited requests. Bricker and Carlson (1980) and Dunst (1980) both reported similar results with younger subjects between the ages of 5 to 29 months. Bricker and Carlson reported a relationship between social and object schemes and coordinated

1983; Motti et al., 1983). The concept of developmental delay implies that children with Down syndrome exhibit communication skills that are similar to much younger nonhandicapped children.

A second method of comparison is to match subjects by developmental age (DA) or MA. Given the expectation that Down syndrome perform in a similar way to younger, nonhandicapped children, comparisons on the basis of DA serve to remove differences in performance that are related to CA. More equivalent comparisons between groups are possible when subjects are matched by DA. A possible disadvantage is that the skills of an older, handicapped child are not equivalent to those of younger, nonhandicapped children. Greenwald and Leonard (1979) pointed out that Down syndrome subjects in their study at a mean age of 40 months were not really comparable to younger, nonhandicapped children with a mean age of 11 months, even when equated for cognitive stage of development. Dunst and Rheingrover (1983) have also reported that infants with Down syndrome in their study had more variable performance on cognitive assessments when compared to published test profiles of nonhandicapped infants by Uzgiris and Hunt (1975).

A third method of matching subjects, based on MLU, is frequently used in linguistic studies of handicapped and nonhandicapped children. Equating subjects on the basis of MLU provides a general linquistic measure. MLU is considered a reliable predictor of linguistic development in the early stages of language (Harris, J., 1983). Comparisons by MLU are obviously not appropriate to address prelinguistic development.

Subjects with Down syndrome have been matched both on the basis of CA and DA in studies of prelinguistic development. In the next section, findings of studies that examined the prelinguistic skills of infants and children with Down syndrome are discussed. Methods of matching subjects varied. While most studies matched subjects on the basis of DA, others included groups matched on CA, DA or other measures of development. Results are influenced by the methods of comparison used.

Prelinguistic communication is studied by observing infants' nonverbal behaviors toward caregivers. The gradual maturity of gaze, gesture and vocal forms are thought to support the emergence of linguistic forms. Handicapped infants exhibit differences in the coordinated use of these early forms in communicative contexts.

Comparisons of prelinguistic development related to gaze, gesture and vocal signals of handicapped and nonhandicapped infants indicate qualitative and quantitative differences. For example, vocalizations of infants with Down syndrome follow a typical developmental sequence (Smith & Oller, 1981; Stoel-Gammon, 1980), but are reduced related to generally low muscle tone (Harris, 1983), and show longer response times (Buckhalt et al., 1978; Stevenson, Leavitt & Silverberg, 1985). Differences in gaze and gesturing also exist for this population. Findings related to gaze, or "looking behavior" is discussed first. The coordinated use of gaze/gesture/vocalization is then reviewed.

The development of <u>referential gaze</u> is considered to be a critical component of intentional communication. Visual attention to people and later to objects becomes elaborated and flexible in later infancy,

enabling the infant to reach for and to look at objects, and to repeatedly switch gaze from object to a nearby adult. For children with Down syndrome, the development of referential gaze appears to have some clear differences in development.

Krakow and Kopp (1983) examined differences in visual attention when comparing three groups of nonhandicapped and developmentally delayed infants matched by developmental age. They found significant differences in sustained attention and gazing at parents between infants in the following groups: nonhandicapped, Down syndrome and undiagnosed etiology. Both groups of developmentally delayed children gazed longer at objects, rather than glancing at mothers. The limited "gaze switching" observed in this study is considered diagnostically significant since this indicates limited ability to incorporate care-givers into object play.

In another study examining "looking behavior" with the addition of vocalization, Gunn et al. (1982) found young Down syndrome infants between 6 and 9 months of age looked more often at their mothers than nonhandicapped infants looked at their mothers. These authors described infants with Down syndrome as more restricted in visual exploration of the environment. Differences in the visual behavior observed by Gunn et al. and Krakow and Kopp (1983) may be related to differences in age of the subjects. The younger subjects in the study by Gunn et al. spent more time gazing at parents than older Down syndrome infants in the study by Krakow and Kopp. Subjects with Down syndrome in the study by Krakow and Kopp had a mean CA of 29 months. At this point of development, more object play would be expected than

to face-to-face gaze with caregivers. The importance of these two studies lies in the pattern of visual behavior observed; infants with Down syndrome in both studies looked at either persons or objects, but not both.

Examining the use of gaze somewhat differently, Sinson and Wetherick (1982) found that little mutual gaze was exhibited by 7 subjects with Down syndrome 2-5 years of age as they played with older siblings at home. Other observational conditions in their study included nursery and school settings for handicapped preschoolers and a play group with nonhandicapped peers. Subjects with Down syndrome were observed to engage in mutual gaze only with other children with Down syndrome. The authors suggested gaze patterns of subjects with Down syndrome were related to familiarity with the setting and interactive partners. In order to draw further conclusions from this study, observations of mutual gaze between nonhandicapped siblings would need to be examined. However, the study by Sinson and Wetherick indicated that gaze patterns in young children with Down syndrome are restricted, related to the setting.

In addition to studies of gaze patterns, the coordinated use of gaze/gesture/vocalization has been compared between nonhandicapped subjects and those with Down syndrome. The studies to be reviewed in this section are all limited by small samples. However, taken together, the findings reported by Bricker and Carlson (1980), Dunst (1980), Messick, Chapman, Brown and Spitz (1983), and Smith and von Tetzchner (1986) offer descriptive information about the intentional communication abilities of young children with Down syndrome.

Bricker and Carlson (1980) conducted a longitudinal study of 10 infants with Down syndrome between the ages of 5 and 29 months. They examined the development of simple, complex and coordinated social schemes (intentional communication) over time and found coordinated social schemes became more frequent by the time subjects reached 17 months of age. Since their sample was small, conclusions from the findings of Bricker and Carlson provide limited support for relationships between the onset of coordinated action schemes and intentional communication and language in children with Down syndrome. Individual differences are reported among the subjects in this study, but it was generally observed that subjects with Down syndrome progressed in their use of simple, coordinated and complex social and object schemes as did nonhandicapped infants studied by Sugarman (1978, in Bricker & Carlson). When comparing the proportion of object and social schemes, however, Down syndrome infants engaged in a greater proportion of object schemes. This finding appears related to limited gaze switching between objects and people as reported by Krakow and Kopp (1983) and Gunn et al. (1982).

Dunst (1980) studied a similar stage of prelinguistic development in 12 subjects with Down syndrome. These children were selected on the basis of cognitive developmental stages IV and V. Six of these subjects functioning at stage IV had a mean age of 15.48 months while six subjects of stage V had a mean age of 33.17 months. Younger, nonhandicapped subjects of similar cognitive stage were selected as a companion sample. When comparing performance of children in the two groups in the use of <u>interpatterned</u> communicative acts, Dunst reported

parallel patterns of development for nonhandicapped infants and children with Down syndrome. Some qualitative differences were observed since children with Down syndrome used more elicited gestures, a larger proportion of nonintegrative pointing, extending arms, waving and hugging. Dunst reported that differences between nonhandicapped and handicapped subjects were more related to cognitive stage of development than group related.

The findings of studies reviewed support a view of both developmental delay and specific differences in the prelinguistic skills of children with Down syndrome. Gaze patterns were found to be less flexible (Gunn et al., 1982; Krakow & Kopp; 1983). While terminology differs, researchers observed similar progression in the use of intentional communicative acts of Down syndrome children. Qualitative differences were reported that may be difficult to detect except as individual differences and not as group differences. In the next section, studies that examined linguistic differences between children with Down syndrome and nonhandicapped children are discussed.

In a study of communicative intentions, Messick et al. (1983) matched 5 children with Down syndrome to 5 nonhandicapped children on the basis of vocabulary size which ranged from 6-18 words for Down syndrome subjects and 7-14 for nonhandicapped children. The mean age for subjects with Down syndrome was 30.8 months and 14.2 months for nonhandicapped children. Messick, et al. (1983) found no significant differences between nonhandicapped infants and children with Down syndrome when comparing the proportional use of different categories of communicative intentions. Messick et al. based analysis on a modified

version of the Communicative Intention Inventory by Coggins and Carpenter (1981). An inverse relationship was found between vocabulary size for both groups of subjects and the use of communicative gestures meaning that children with fewer vocabulary words used more gestures. As a group, children with Down syndrome tended to use limited vocabulary and used more gestures compared to their nonhandicapped counterparts. Greenwald and Leonard (1979) also found that children with Down syndrome used fewer vocalizations than nonhandicapped infants and relied more on gestures when using declaratives. These two pieces of information, combined with findings reported by Dunst (1980), indicate qualitative delays in intentional communication behavior of infants and children with Down syndrome which are not measurable as a quantitative delays.

Recently, Smith and von Tetzchner (1986) compared the cognitive, language, and pragmatic skills of 13 children with Down syndrome and 18 nonhandicapped children of similar mental age. These authors found that subjects with Down syndrome performed significantly below the nonhandicapped group on declarative tasks. Declarative tasks (comments) assess a child's ability to direct adults' attention to a particular object at a prelinguistic level. This particular finding is interpreted as evidence of a particular deficiency in expressive communication among children with Down syndrome. Down syndrome subjects were 24 months at the time of this particular assessment and the nonhandicapped children exhibited a mean CA and MA of 13 months.

In the studies just described, communication skills generally did not differ significantly when children with Down syndrome were compared

to nonhandicapped children of similar cognitive and language stages of development. Some qualitative differences were reported by Messick et al. (1983) and Dunst (1980) who observed increased use of gesturing. The primary finding of Smith and von Tetzchner (1986), that children with Down syndrome perform fewer declaratives in elicited tasks, is in contrast to that of other investigators. The manner in which communicative intents were studied may explain these contrasting findings. Smith and von Tetzchner employed elicitation tasks to examine commenting and requesting behaviors while other investigators observed spontaneous play between infants and mothers. Coggins, Olswang, and Guthrie (1985) recently reported that fewer declaratives were evident during elicited tasks than spontaneous play in their sample of nonhandicapped infants. Smith and von Tetzchner did have a matched sample of nonhandicapped infants for comparison and their Down syndrome infants still performed fewer declaratives at the prelinguistic level.

Taken together, these findings imply that children with Down syndrome exhibit qualitative differences in their intentional communication skills. Comments were difficult to elicit with nonhandicapped infants (Coggins et al., 1985), but showed a rapid increase when subjects were 18 months of age. For children with Down syndrome in the study by Smith and von Tetzchner (1986), the subtle elicitation tasks did not register notice from the child. Further, assessment in this manner does not represent what has been reported in spontaneous settings for children with Down syndrome.

However, prelinguistic children with Down syndrome exhibited specific delays in the use of intentional communication when compared to nonhandicapped children. For children with Down syndrome, fewer nonverbal communicative turns and more meaningless vocalization were observed than for their nonhandicapped counterparts (Mahoney & Robenalt, 1986). Further investigation of prelinguistic behaviors is warranted based on the subtle differences observed when comparing nonhandicapped children and those with developmental delays, specifically Down syndrome.

Mother-Child Interaction

Maternal communication style with handicapped children has been primarily studied in the context of verbal language development. Few studies have examined communication exchanges at the prelinguistic level between mothers and their handicapped infants. Buckhalt, Rutherford, and Goldberg (1978) studied nonverbal and verbal interactions in mother-child dyads with Down syndrome and nonhandicapped infants from 9.5 - 17.0 months of age. Mother-infant pairs were matched by infants' chronological age. No differences were found in linguistic complexity or nonverbal interactions of mothers. Down syndrome infants exhibited significantly less vocalization and smiling in response to their mothers than nonhandicapped infants. Since mother-infant pairs were matched by the infants' chronological age, reduced social responsiveness of Down syndrome infants in this study could be expected related to developmental delay. Also, mothers of infants with Down syndrome were reported to talk at a faster rate, perhaps because their babies were less responsive.

While differences in the responsiveness of Down syndrome infants may contribute to differences in parental response, parents of retarded and nonretarded infants follow a similar sequence in speaking to their babies, simply, with slowly increasing complexity. The point at which mothers of children with Down syndrome become different than mothers of nonhandicapped children is unclear. Longer response time and less noticeable cues from infants with Down syndrome appear to both discourage some parents from interacting while increasing attempts of other parents. Mahoney (1983) found mothers of Down syndrome infants varied considerably in maternal language style. He was able to divide mothers into groups including responders, attenders, and ignorers. Only one group, responders, showed a high level of semantic contingency in speech to their children. The interactional component of responders, both mother and child, was described as central to maintaining communication. The range of variability reported in this study supports the notion that mothers of handicapped children differ among themselves as do mothers of nonhandicapped children.

Other studies of mother-child interaction when children have Down syndrome have reported parents' style ranges from more directive to more responsive. Differences in findings can be explained, in part, by the type of analysis in each study. Stoneman, Brody, and Abbott (1983) observed general interaction patterns between parent-child dyads and triads including both parents. They found parents of children with Down syndrome to be more contingently responsive to child behavior in play settings than parents of nonhandicapped children. This particular finding reported by Stoneman et al. contrasts to a more widely reported

pattern that parents of children with Down syndrome are less contingent, meaning less responsive, to the content of child behavior (Jones, 1980; Mahoney, 1983; Mahoney & Robenalt, 1986; Peterson & Sherrod, 1982). Perhaps general responsiveness to child behavior in a play situation as observed by Stoneman et al. may mask limited parental response to specific communicative behavior of the child. Crawley and Spiker criticized group comparison studies, pointing out that maternal directiveness to Down syndrome children may not necessarily be insensitive to child signals. Individual differences in maternal style were found, showing mothers exhibited a variety of interactions including directiveness, intrusiveness and sensitivity. Mothers who were sensitive and directive provided the most stimulation to their children. Subsequent studies have supported these findings although more stimulation from mothers is not considered a facilitative style for infants' preverbal communication.

Although findings differ, the report that mothers of Down syndrome children are more directive in their interactions than mothers of nonhandicapped children is prevalent. Recently, Mahoney and Robenalt (1986) compared differences in turn-taking interactions of mothers with Down syndrome children and mothers of handicapped children. Mothers of children with Down syndrome took more turns than their children compared to mothers of nonhandicapped children who exhibited more balanced turns. Additionally, mothers of children with Down syndrome exhibited twice as many mands, defined as requests for further interaction from their children. Mahoney and Robenalt evaluated children's turn types, finding that children with Down syndrome exhibited fewer

mands and response/mands and more unlinked turns than nonhandicapped children matched by developmental age. These findings mean that Down syndrome children in this study were responsive to mothers' interaction but solicited less interaction from their mothers and were generally less active in play than their nonhandicapped counterparts. Mahoney and Robenalt proposed that less activity on the part of children with Down syndrome promoted greater directiveness or mand behavior on the part of mothers. Mothers in both groups responded at a similar rate to their children's interactions. Mahoney and Robenalt reported mothers of children with Down syndrome produced 2.3 times more mands to their children than mothers of nonhandicapped children. These authors point out the possibility that children with Down syndrome are taught to communicate less as their mothers mand more. Indeed because of the extensive evaluation of turn-taking data and the number of dyads included (20 in each group) these findings are important to understand the nature of patterns of interaction between developmentally delayed children and their caregivers.

Mother's responsiveness to their children with Down syndrome is complicated by several variables including mothers' individual styles (Mahoney, 1983) and child characteristics (Mahoney & Robenalt, 1986; Cardoso-Martins, & Mervis, 1985). Most authors agree that both parent and child characteristics contribute to differences observed in dyads with a Down syndrome child compared to dyads with nonhandicapped children. Maternal perception of child's competence is another variable related to interaction with the child. In a study of two mothers and their children with Down syndrome, Mahoney (1975) reported

mothers responded more as their children become more linguistically sophisticated. Less responsiveness was observed to children's non-verbal signals than to words. In a study of 111 handicapped infants in three groups (Down syndrome, cerebral palsy and developmental delays), Brooks-Gunn and Lewis (1984) also found children's mental age to be more related to maternal responsivity than diagnostic classification.

Parental responsiveness was found to be related to developmental quotient in a number of ways by Smith and Hagen (1984). These investigators observed interactions between parents of Down syndrome infants and nonhandicapped infants. Mothers of infants with Down syndrome were found to behave differently, providing more tactile stimulation and postural support related to the lower developmental quotient of these infants. Play interactions, mediation with objects and social stimulation were found to be positively related to infants' developmental quotient in both groups.

Infants' response time was also found to affect mothers' perceptions. Stevenson, Leavitt, and Silverberg (1985) labelled vocalizations of infants with Down syndrome as "not contingent" upon mothers' preceding utterances. In fact, vocalizations may have been contingent but not perceived as such because of the longer response time required for these infants. The findings of Smith and Hagen and Stevenson et al. support the statement made earlier by Mahoney (1975 1983) that mother's interactions with their Down syndrome babies increased as these babies become verbal. Comparisons of maternal responsiveness to children with Down syndrome and mothers of

nonhandicapped children are affected by developmental level of subjects in the studies reviewed.

Findings in studies of mothers' interactions with children with Down syndrome differ. Mothers were characterized as more directive in their interactions than mothers of nonhandicapped children (Mahoney & Robenalt, 1986). Buckhalt et al. (1978) found mothers spoke at a faster rate than mothers of nonhandicapped children. Related to a higher rate of response to their children, mothers of children with Down syndrome took more turns than their children and 2.3 more mands than mothers of nonhandicapped children (Mahoney & Robenalt, 1986). However, when mothers were compared on rates of responsivity to their children, no differences were observed between nonhandicapped and Down syndrome groups. Stoneman et al. (1983) also observed a high rate of contingent response by parents to their children with Down syndrome. These findings present a view that mothers of children with Down syndrome are responsive, yet directive toward their children.

Variation in maternal interaction with Down syndrome children was reported by Mahoney (1983) who found distinctly different styles of interaction in mothers. Mothers also responded more to linguistic behavior than to prelinguistic behavior (Mahoney 1975 1983), a finding that is related to the predictive relationship between developmental age of infants and maternal responsiveness (Brooks-Gunn & Lewis, 1984). Mothers responded more to children as developmental age increased. Characteristics of children with Down syndrome certainly contribute to mothers' responsiveness (Mahoney & Robenalt, 1986). Investigations of turn taking at the prelinguistic level combined with studies of

prelinguistic behaviors of children with Down syndrome support the conclusion that these children initiate less in communicative interactions and their mothers are more directive (Mahoney & Robenalt, 1986; Smith & von Tetzchner, 1986).

Siblings of Handicapped Children

Attention to the concerns of families with handicapped children in the last decade has focused increasingly on sibling relationships. Siblings of handicapped children, while having a different role in the family, require similar understanding and support in acceptance of handicaps (Powell & Ogle, 1985). As Anderson and Spain (1977, p. 81) stated:

> ...siblings have to come to terms with attitudes of other people, to their handicapped brother or sister, including their peers from outside the home. They are often quick to perceive the social stigma attached to a handicap and this may be reflected in their unwillingness to bring friends into the home.

The difficulties experienced by siblings in accepting a handicapped child in the family are related to the age of the nonhandicapped sibling, birth order, and socio-economic status (Crnic & Leconte, 1986). In spite of differences among families, a high degree of commonality in siblings' needs and concerns is reported by Powell and Ogle (1985). These include increased responsibilities for a special child in the family, confrontations with peers, questions about the particular handicap and excessive time and parental attention focused on the child with a handicap (Philp & Duckworth, 1982; Powell & Ogle, 1985; Schutt, 1977).

Interaction Between Nonhandicapped Siblings

Changes introduced by a handicapped child in the family are not necessarily detrimental to nonhandicapped siblings. In fact, increased awareness of differences among people can result for the nonhandicapped sibling (Crnic & Leconte, 1986). However, when one sibling is handicapped, changes in sibling roles and interactions do occur and need to be addressed. Before discussing concerns of "special siblings" further, interactions between nonhandicapped siblings are discussed to clarify sibling relationships and their role in early development.

The special bond between siblings has been referred to as an intense, life-long relationship (Cicirelli, 1982). In the early years, nonhandicapped siblings are described as "socialization agents" (Dunn & Kendrick, 1983). Berndt and Bulleit (1985) studied the effects of siblings on the behavior of preschool children. Their main findings showed preshoolers with older siblings interacted more with classmates while those with younger siblings were more responsive to aggression and prosocial behavior of peers, taking a less dominant role in interaction. In another study of sibling interaction, Stewart and Marvin (1984) found that older siblings' caregiving skills, and cognitive skills were related to the behavior of younger siblings. Caregiving skills of older siblings between 3 and 5 years of age improved with age and the ability to take another person's perspective in conceptual tasks. Additionally, infants with more "care giving" siblings explored playrooms more freely and demonstrated attachment to older siblings when a stranger entered. As can be seen from these two

studies, interactions between siblings in the early years contribute to the development of each partner.

Interactions between nonhandicapped siblings are affected by several variables, including age and gender. In an exploratory study of sibling interaction, Abramovitch, Corter and Lando (1979) found a high level of interactive play between siblings in 34 same-sex dyads with two and three years age difference. Play interactions in their study were characterized as agonistic (competitive), prosocial, initiative, and responsive. High frequencies of agonistic and prosocial behavior were found, with older siblings initiating more. More positive responses than negative responses were observed for both siblings. Younger siblings imitated more often than older siblings. Additionally, older sisters engaged more in positive, responsive behavior. No effects of age intervals were found.

In contrast to the findings of Abramovitch et al. (1979), Minnett, Vandell and Santrock (1983) reported significant effects of age spacing, birth order and sex of siblings. Forty-three pairs of siblings were studied with one sibling in each dyad at age 7 or 8 having younger or older siblings. Differences in play interaction between siblings were found with aggression more common with close ages and more teaching by older sisters. More positive, affectionate behaviors were exhibited by first-born siblings who were 3-4 years older. Additionally, first born siblings who were 7-8 years old were more dominant with younger siblings. The variables of age spacing, age of older siblings, gender and birth order were reported in these two studies to affect the style of play between siblings in fairly specific

ways. The wider age-spacing in the study by Minnett et al. may have accounted for differences in findings related to the effects of age spacing.

To summarize the results of studies of nonhandicapped siblings, siblings who are 3-4 years older exhibit more caregiving to younger siblings, related to cognitive skills. Female siblings who are older appear to engage in a more caregiving role. Aggression between siblings appears increased with closer age spacing. Overall, siblings engaged in more positive than negative interactions.

At the nonverbal level, Dunn and Kendrick (1983) observed play between siblings to have a joint focus with frequent give and take of objects, becoming elaborated and varied with repetition. The sibling interactions observed by Dunn and Kendrick were characterized by frequent nonverbal communication including gesturing, looking, smiling, vocalizing and laughter. Observations comparing mother-infant and sibling-infant interactions showed a higher frequency of communicative gestures and vocalizations between infants and mothers than between infants and siblings. The implication here is that adults play a more important role in early communication and language acquisition for infants than do siblings.

However, the supporting role of older siblings is apparent in another study by Dunn (1982) that examined co-action schemes between siblings. Older siblings and babies were observed twice, once when babies were 8 months of age and again when babies were 14 months of age. A significant effect of sibling imitation was found. Babies who were imitated by older siblings at 8 months showed increased imitation

of older siblings' actions at 14 months. In other words, imitation by older siblings contributed to increased imitation by babies after a few months. The observational findings just described support the reciprocal role of siblings to practice developing communication and language skills.

Interactions with a Handicapped Sibling

Limited information is available regarding sibling interaction when one child is handicapped. Crnic and Leconte (1986) recently reviewed findings related to special siblings, reporting varied feelings, roles and responses of nonhandicapped siblings to a handicapped sibling. In the studies reviewed, Crnic and Leconte found risks and benefits for special siblings. The risks included too much caregiving responsibility placed upon nonhandicapped siblings, competition for parental attention, parental pressure to compensate for the handicapped child and alterations in family interactions. An advantage is increased understanding on the part of nonhandicapped siblings for those with handicaps.

In their study, Mash and Johnson (1983) observed 23 sibling dyads with one hyperactive member. When compared to nonhandicapped siblings, hyperactive siblings exhibited less independent play, more negative behavior and more frequent initiations toward the nonhandicapped sibling. A relationship was found between mothers' reports of high levels of stress in the home and negative behavior between siblings. Alterations in sibling interactions, when one child is handicapped, require further study to provide guidelines for professional intervention and support.

The role of older siblings as teachers for younger handicapped siblings has support in the literature. Cicirelli (1975) found older nonhandicapped siblings 6 and 7 years of age can effectively teach younger siblings problem-solving tasks in structured situations. Cicirelli also reported female siblings to be more effective than male siblings or female nonsiblings in teaching younger brothers and sisters. Several authors (Fairfield, 1983; Meyer, Vadasy & Fewell, 1985; Starr, 1984) have expressed concern that it is not in the best interests of siblings handicapped children to teach a handicapped child in the family. For example, Byrnes and Love (1983) feel siblings should receive opportunities to explore feelings in planned settings, such as workshops or recreational activities.

Meyer et al. (1985) presented a model called Sibshops to explore concerns of special siblings in planned recreational settings with an informational component. Goals of Sibshops include opportunities to meet other siblings, to share experiences, to learn strategies for handling difficult situations, to provide an opportunity to learn accurate information and to increase parental awareness of sibling concerns. In light of the increased vulnerability to the effects of stress experienced by families and siblings of handicapped children, intervention programs require careful consideration. Dyson, Fewell and Meyer (1986) found no differences in self-concept measures administered to siblings of handicapped and nonhandicapped children, but emphasized the need for information and support for siblings with a handicapped family member. Concerns for older siblings include the need for accurate information, clearly defined expectations within the family,

interactions with peers and social support. Based upon the studies reviewed by Crnic and Leconte (1976), special siblings are reported to be vulnerable to increased stresses of greater caretaking responsibilities. These stresses are mediated by the variables mentioned above. Attention and services for the needs and concerns of special siblings, particularly within the family context, is warranted.

Investigators have reported success with siblings as intervention agents. Brown Miller and Cantwell (1976) emphasized the importance of training siblings to reinforce appropriate behavior of target children in families receiving therapy. Recently, Labato and Tlaker (1985) found a 21-year-old female sibling of a 13-year-old male with Down syndrome effectively taught daily living skills to her brother. James and Egel (1986) found direct prompting to be effective to promote reciprocal interaction between handicapped and nonhandicapped siblings. Three handicapped children between 4-5 years of age and their older siblings participated in a single-subject, multiple baseline design. Reciprocal interactions increased and were maintained over a six-month period. Additionally, initiations by handicapped and nonhandicapped siblings showed substantial changes. James and Egel provide empirical support for intervention which increases sibling interaction. Long term effects on siblings' self-concept and family functioning have not been assessed.

Evaluating Intervention with Siblings

In an effort to assess the effect of interventions which address the interactive systems of family member observational research employs ongoing sampling using videotaping. Interaction patterns between

family members are then coded by trained observers. Vadasy, Fewell, Meyer, and Schell (1984) recommended direct observation as a means to assess the effect of a handicapped sibling on nonhandicapped siblings. Sampling interactive behavior avoids the biases that can be introduced by self-reporting and questionnaires. In addition to direct observation using videotaping, Bandura (1982) proposed a model of assessing psychotherapeutic interventions that is based upon information obtained from individuals regarding their own perceptions of treatment efficacy.

Bandura (1982) found self-efficacy to be a valid construct in his experiments with individuals exhibiting various phobic conditions. Self-efficacy, or the individual's own evaluation of treatment effectiveness, predicted subsequent behavior better than actual observations of behavior following treatment. Bandura's theory of self-efficacy may have relevance for special siblings when the focus of intervention is to promote more successful interaction with a handicapped sibling. Parents' perceptions of treatment efficacy need to be considered in addition to direct measures of sibling interaction.

Summary and Questions Investigated

This review concentrated on four major areas, intentional communication development of normally developing infants, studies of intentional communication in children with Down syndrome, mother-child interaction with Down syndrome infants and sibling interaction. The main findings presented in each area are summarized.

The period of development referred to as intentional communication was described for normally developing infants. The rapid transition from preverbal to verbal forms during this time takes place in just a

few months. Individual differences are certainly observed, but investigators have agreed that persistent signalling by infants to caregivers becomes more sophisticated and elaborated. Halliday's (1979) descriptions of his son Nigel are the most graphic, as gestures accompanied by vocalizations became more precise and emerged as vocables, just prior to words. The social and cognitive bases of intentional communication were also reviewed, emphasizing the interaction process between parent and child as the context for practicing emerging gaze, gesture and vocal signals. Relationships of particular cognitive skills to the emergence of intentional communication were examined, emphasizing the changing nature of relationships between means-end skills, imitation and play schemes as language emerges. The intentional period is important because developing cognitive skills and social interaction combine in communication behavior during this time.

A normative model of intentional communication development was applied to infants with Down syndrome. Particular characteristics of infants with Down syndrome, such as less flexible gaze when compared to nonhandicapped infants, were discussed (Gunn et al., 1982; Krakow & Kopp, 1983). Limited gaze switching between objects and caregivers observed in children with Down syndrome suggests a particular area of concern for these children. To develop persistent signalling with vocal, gestural and gaze behaviors, coordinated use of these behaviors in a communicative context is needed. Referential gaze, or gaze-switching between object and adult is one area of specific difference for children with Down syndrome compared to nonhandicapped

children. Dunst (1980) and Bricker and Carlson (1980) conducted similar studies with small groups of infants with Down syndrome and reported that intentional communication was certainly delayed, quantitatively. Qualitative descriptions of intentional communication behaviors indicated that infants with Down syndrome used more gestures than their nonhandicapped counterparts. Messick et al. (1983) also found children with Down syndrome used more gestures than non-handicapped children at the same vocabulary level. Observations of specific differences for children with Down syndrome were also reported in response to elicitation tasks. Down syndrome children used fewer comments than nonhandicapped counterparts, matched by developmental age.

Parent-child interaction studies are primarily limited to observations of mothers and their children. Mothers of children with Down syndrome have been characterized as less responsive and more directive to their children than mothers of nonhandicapped children (Peterson & Sherrod, 1982). Several studies examined did not support this description of mothers with their Down syndrome children. Rather, mothers were reported to exhibit more turns to their children and 2.3 more mands than mothers of nonhandicapped children (Mahoney & Robenalt, 1986). Additionally, mothers responded more to their children as developmental age increased and more to linguistic behavior than to prelinguistic behavior (Mahoney, 1975; Brooks-Gunn; 1984). The role of infants with Down syndrome cannot be discounted in these findings. Weaker and less frequent communicative signals in this population when

compared to nonhandicapped children contribute to mothers' responsiveness.

Studies of nonhandicapped siblings were examined in order to establish a basis of comparison for sibling dyads when one member is handicapped. Interactions between nonhandicapped siblings were characterized as more positive than negative (Abramovitch et al., 1979). Siblings who were 3-4 years older and who demonstrated the cognitive ability to take another person's perspective also took a more caregiving role to younger siblings. Concerns of siblings of handicapped children or "special siblings" were reviewed and the need for direct observational data was sound. Studies of prelinguistic skills of infants with handicaps, particularly those with Down syndrome have concentrated primarily on parent-child dyads. Interventions with sibling dyads when the younger child is handicapped are needed. The primary purpose of this study was to observe sibling interactions prior to and following direct observation.

In the first phase of this study, sibling interaction was observed in six sibling dyads. Observations of sibling interaction during the baseline phase of this study will add to the information available regarding the interaction between older, nonhandicapped siblings and younger siblings with Down syndrome. Based upon what is known about interaction between nonhandicapped siblings, it is expected that older siblings will take more turns, initiate more frequently, direct and initiate play activities more frequently than younger siblings. Based upon what is known about parent-child interaction with their Down

syndrome child, older siblings of these children are expected to respond less contingently to communicative acts of younger siblings.

In the second phase of the study, the effects of directly teaching social communication strategies to older siblings were assessed. MacDonald and Gillette (1984), Mahoney and Powell (1984) and Manolson (1984) have developed materials designed to increase social-communicative interactions for parents and children. Through application of such interventions, older siblings of handicapped children are expected to show increased levels of responsive turns with younger, handicapped siblings.

Three related, but secondary purposes of the study were to investigate the indirect effects of intervention on younger siblings' communicative behavior, mothers' responsiveness and parents' perceptions of outcome. The effect of training older siblings on the communication development of younger siblings with Down syndrome was investigated. The period, intentional communication, is a critical one for these children. For infants with Down syndrome, coordination of intentional communication is complicated by limited use of referential gaze, fewer declaratives, more variance in cognitive skills and more subtle and less frequent communicative acts than nonhandicapped infants (Bricker & Carlson, 1980; Dunst, 1980; Dunst & Rheingrover, 1983; Gunn et al., 1982; Mahoney & Robenalt, 1986; Smith & von Tetzchner, 1986). Parents of children with Down syndrome are reported to take more turns and respond less contingently to infant signals (Mahoney & Robenalt, 1986). Training with older siblings to respond to infant signals should increase communicative opportunities. Sandall (1986) found

increased, but variable levels of intentional communication, when training mothers to respond to nonverbal acts of their Down syndrome infants during play interactions.

Fourth, the indirect effect of intervention with siblings dyads on the mother-child dyad was observed. Changes in mothers' responses to their infants with Down syndrome will be monitored periodically throughout the study. Direct intervention with the older siblings in each dyad may indirectly effect mother-child interactions.

Finally, parents' perceptions of the intervention with siblings were assessed. Drawing on Bandura's theory of self-efficacy, parents' perceptions may have a relationship to the continued effect of intervention with older siblings.

In this study five research questions were investigated. These are summarized as follows:

1. To what extent do older siblings exhibit responsive turns to younger handicapped siblings in play interactions?
2. To what extent will older siblings increase their responsive turns to younger siblings in play interactions following intervention?
3. What will be the effect of training older siblings on the communication behavior of younger siblings?
4. To what extent will mothers exhibit responsive turns to the youngest child without direct intervention?
5. Following intervention how will parents evaluate the intervention with their children?

CHAPTER III

Method

Subjects and Settings

Families were located through agencies and programs serving retarded citizens in King and Pierce Counties including the Experimental Education Unit (EEU) at the University of Washington, King County Association for Retarded Citizens and various developmental centers. These service providers were notified of the study and acted as the intermediary, giving letters of explanation to parents. Participation in the study was voluntary and interested parents contacted the investigator by telephone or mail.

Parents who contacted the investigator were further interviewed by telephone to determine ages of younger and older siblings in each family. Eight families responded to explanation letters received through the intermediary and six of these families were included in the study. One family was not able to participate because the older sibling was also handicapped. Another family had participated in a similar study the previous year. The remaining six families had children who closely fit the criteria for the study. Younger subjects with Down syndrome had no other handicapping conditions. Families who both met the criteria and agreed to participate were then told the general procedures of the study. The study took place entirely in families' homes.

Six sibling dyads were selected as subjects for this research project. The younger member of each dyad had Down syndrome. Age criteria for younger subjects were between 1 and 3 years of age and for

the older subjects, between 6 and 10 years of age. Criteria were altered slightly in order to include six families. Younger subjects ranged from 16-41 months of age and older subjects were between 6 and 8 years of age. Age criteria for older and younger subjects in sibling dyads were determined by the research questions posed in this study and literature reviewed in the previous chapter. Investigators have reported that intentional communication in nonhandicapped children emerges between 9 and 12 months age (Bates et al., 1979; Harding & Golinkoff, 1979). Children with Down syndrome can be expected to exhibit significantly delayed development in this process (Harris, J., 1983; Bricker & Carlson, 1981; Dunst, 1980). Age criteria for older siblings was set so that these subjects could understand and apply social and communication strategies (SCS) with younger, handicapped siblings. Based on the results of studies of nonhandicapped siblings, older siblings who were 3 to 4 years older exhibited more caregiving skills to younger siblings (Minnett, Vandell & Santrock, 1983). Stewart and Marvin (1984) found that the ability to take another person's perspective was related to caregiving skills of older siblings between 3 and 5 years of age.

Subject characteristics, including gender and ages are presented in Table 1. For consistent reference, younger subjects in each sibling dyad will be noted as YS 1, YS 2, YS 3., etc. Older subjects in each sibling dyad will be noted as OS 1, OS 2, OS 3, etc. Chronological ages of YSs ranged from 16-41 months with a mean age of 29.8 months. Chronological ages of OSs ranged from 6 years; 1 month to 8 years; 2 months with a mean age of 7 years.

Table 1. Gender and Ages of Subjects

Dyad	Subjects	Sex	Age	Subjects	Sex	Age
1	YS 1	M	41 mo.	OS 1	F	6 years; 6 mo.
2	YS 2	F	19 mo.	OS 2	F	7 years; 10 mo.
3	YS 3	F	29 mo.	OS 3	M	6 years; 1 mo.
4	YS 4	M	37 mo.	OS 4	M	8 years; 2 mo.
5	YS 5	M	16 mo.	OS 5	F	6 years; 8 mo.
6	YS 6	F	37 mo.	OS 6	M	6 years; 2 mo.
$\bar{x}$			29.8 mo.			7 years
Range			16.41 mo.			6;1-8;2 years

Mothers were also requested to participate as subjects in periodic videotaped segments. Three mothers of the six families in the study were willing and/or available to be videotaped in periodic probes. These three mothers were parents of siblings in Dyads 2, 4 and 5.

Assessments were given to YSs prior to beginning the study to determine developmental characteristics at the outset. A trained examiner with Master's degree in Early Childhood administered assessments. Originally, both the Bayley Scale of Infant Development (BSID) (Bayley, 1969) and the Ordinal Scales of Psychological Development (OSPD) (Uzgiris & Hunt, 1975) were to be administered to each YS subject. However, the oldest YS was 41 months and a ceiling score could not be obtained for this subject using the BSID. Additionally, two YSs received scores on the BSID that resulted in Mental Development Index (MDI) scores below 50. For these two reasons,

developmental age (DA) scores obtained with the BSID are reported for 5 YSs. A developmental age, obtained with the Early Intervention Developmental Profile (EIDP) is reported for YS 1. Developmental ages obtained for 5 YSs with the BSID ranged from 8 to 26 months. Use of the EIDP for YS 1 resulted in six DA scores, for six domains and ranged from 28 to 35 months. Developmental ages are listed and communication behavior of YS are described.

Developmental Characteristics.

YS 1. CA: 41 months
Male

EIDP $\bar{X}$ DA: 33 months

Perceptual-Fine Motor: 35 months
Cognitive: 32 months
Language: 28 months
Social/Emotional: 31 months
Self-Care: 35 months
Gross-Motor: 35 months

This child had an extensive receptive vocabulary prior to the study. He also used nearly 100 signs in response to a verbal cue. His mother reported few signs were initiated toward others. Beginning verbalizations were observed in the form of consonant-vowel units such as /bʌ/ for ball, /ʌpo/ for apple, etc. This subject used spontaneous gestures combined with vocalizations, extensively. For example, he pointed and vocalized /dʌ/ when requesting his sister to play ball a certain way.

YS 2. CA: 19 months
Female

BSID DA: 8 months

This subject responded to familiar games such as peek-a-boo and pat-a-cake. She imitated gestures on objects such as kissing dolls, patting and hugging. Comprehension of object names was limited to a few familiar items such as ball, shoe, baby, etc. She occasionally pursued objects when encouraged by her sister with directions such as, "Get the ball," etc. Vocalizations were limited to vowels and occasional labial consonants /b/ and /m/. Spontaneous gestures appeared limited to waving arms and legs in response to favorite games, reaching for desired objects and throwing toys. Stranger anxiety was observed when she was alone in the playroom with study personnel.

YS 3. CA: 29 months
Female

BSID DA: 17 months

This subject appeared to understand directions such as "Come here," "Get the ball (or other specific noun)," etc., since she responded with meaningful actions. She used toys meaningfully in her play schemes, particularly baby dolls. Vocalizations were limited although word-like approximations were observed occasionally such as /sʌ/ for shoe and /bʌ/ for baby. Limited use of signs was observed in the home, although she imitated new signs when her brother modelled them for her. Spontaneous gestures such as waving her hands in the direction of desired objects, turning away from others, holding onto desired objects and facial grimacing toward others were observed.

YS 4. CA: 37 months
Male

BSID DA: 23 months

This child was very vocal and outgoing with his family and study personnel. He exhibited extensive "conversational jargon" with occasional intelligible words mixed with many unintelligible vocalizations. Elaborate play schemes were demonstrated with vehicles, balls, musical instruments, etc. Receptive vocabulary was observed and reported to be extensive, including family names, past events, categories of familiar objects, etc. Use of sign language was reported as a past aid, but was not observed extensively in the current repertoire of this subject. However, he imitated easily when presented with signs. Spontaneous gestures such as pointing to direct attention of others, to request objects, showing and giving objects were observed frequently.

YS 5. CA: 16 months
Male

BSID DA: 9 months

This subject demonstrated attention to his surroundings and responded to his sister's initiations of familiar games. He imitated games such as peek-a-boo. Vocalizations were infrequent and limited to vowels. Mobility was limited due to low muscle tone. Spontaneous gestures were observed such as waving arms toward people nearby and kicking legs in response to games. Grasping and holding objects were limited, although he imitated actions such as banging musical toys, etc.

YS 6. CA: 37 months
Female

BSID DA: 26 months

Although shy with strangers, this subject demonstrated an extensive receptive and expressive vocabulary. She frequently labeled objects in her environment such as "baby," "clock," "shoe," "blocks," etc. Limited use of sign language was observed, although parents reported earlier use of sign to develop vocabulary comprehension. Initiated communication toward family members was not observed frequently. Solitary play was observed with several serial acts in her play schemes, such as wrapping and feeding dolls. Spontaneous gestures observed included reaching toward desired objects and familiar actions with toys such as talking on the telephone.

Cognitive Assessments

Assessments of cognitive development were performed, based on relationships reported between cognitive and intentional communication. In studies of nonhandicapped infants, investigators have found relationships between sensorimotor stages IV and VI and the emergence of intentional communication (Bates et al., 1979; Harding & Golinkoff, 1979). Particular cognitive tasks including means-end, imitation, combinatorial play and symbolic play were found to have the strongest relationships to intentional communicative acts (Bates et al., 1979). Similar relationships between sensorimotor stages IV and V and interpatterned (intentional) communicative acts were reported in a study of children with Down syndrome by Dunst (1980).

Cognitive assessment was performed using the OSPD instrument. Seven subtests were administered to YSs, including object permanence, means-ends, vocal imitation, gestural imitation, causality, space and schemes. Sensorimotor stage scores ranged widely, from III to VI, with

modal scores of IV and above for six YSs. Estimated developmental ages (EDA) ranged from 8.1 to 21.3 months. Subtest scores, EDAs and modal stage for six YSs are shown in Table 2. Scores in parentheses indicate that YSs did not reach a ceiling for these particular subtests. For these subjects, this particular assessment may have underestimated cognitive ability.

Table 2. Results of Assessment with the Ordinal Scales of Psychological Development for Younger Siblings

Subjects	CA mo.	EDA mo.	OP	ME	VI	GI	C	SP	SC	MODE	RANGE
YS 1	41	21.3	(VI)	(VI)	IV	(VI)	(VI)	(VI)	(VI)	VI	IV-VI
YS 2	29	15.9	VI	VI	III	III	V	VI	V	VI	III-VI
YS 3	19	9	IV	V	III	III	IV	IV	IV	IV	III-VI
YS 4	37	19.3	(VI)	VI	IV	(VI)	V	(VI)	V	VI	IV-VI
YS 5	16	8.1	IV	V	III	IV	IV	III	IV	IV	IV-V
YS 6	37	20.9	VI	VI	V	(VI)	(VI)	(VI)	(VI)	VI	V-VI

( ) indicates ceiling not obtained
OP - Object Permanence
ME - Means-Ends
VI - Vocal imitation
GI - Gestural imitation
C - Causality
Sp - Space
Sc - Schemes

Intervention Procedures

Six older, nonhandicapped siblings received direct training to employ social communication strategies (SCSs) with younger, handicapped siblings. The strategies taught to older siblings were based on the intervention model developed by MacDonald and Gillette (1984) and

the older siblings. During intervention sessions with older siblings, other family members were free to observe. The investigator requested family members to refrain from interaction with OSs during training and during videotaping sessions. Intervention continued for six sessions for all OSs in the study. Intervention was presented weekly for six weeks for OSs in Dyads 1, 2 and 3 and twice weekly for three weeks for OSs in Dyads 4, 5 and 6. Each visit to the home followed the same procedures during the intervention including modelling, verbal instruction, role-play and coaching. A ten-minute videotaped sample was obtained while siblings played together, following modelling, verbal instruction and role-play. Intervention procedures were implemented in the following manner.

1. Modelling. A 5-10 minute videotape was presented showing puppets modelling one of three social communication strategies (SCS): follow the younger child's lead, take turns, and change-a-little. Six segments were prepared in advance with two segments devoted to each social communication strategy listed. Scripts for each puppet modelling segment are included in Appendix A.

2. Verbal Instruction. Following the puppet modelling procedure, the concept presented was briefly reviewed with the older sibling. Verbal instruction proceeded according to the script included in Appendix B.

3. Role Play. Following verbal instruction, the older sibling was invited to practice the particular strategy presented with the investigator prior to showing the younger sibling. To illustrate

included follow-the-leader, take-turns and elaborate. In this study, familiar games such as ball play, blowing bubbles, peek-a-boo, containers, wind-up toys, etc., were used as the context for learning and applying SCS.

The study proceeded in three distinct phases, baseline, intervention and follow-up. All subjects received the same intervention, including a modelling procedure, verbal instruction, role playing and social reinforcement. In this section, procedures followed during each phase of the study are described. In the sections that follow, the timing, length of phases and design of the study are described.

Phases of the Study

A. Baseline. During this phase, subjects were videotaped while engaged in an unstructured play session. Videotaping was conducted for a period of 10 minutes, weekly for two to four weeks. Siblings were provided with a standard set of toys and requested to play together. Older siblings were told by the investigator, "Here are some toys that many kids like. Go ahead and play with (younger sibling's name) as you usually do. Use the toys to play any of your favorite games together." The baseline phase continued for varying lengths of time according to the order of participation in the study. Dyads 1 and 4 remained in baseline for two weeks, Dyads 2 and 3 for three weeks and Dyads 3 and 6 for four weeks.

B. Intervention. Following the baseline phase, an intervention was introduced. This phase consisted of four components including modelling by puppets, verbal instruction, role playing and coaching for

alternative ways to follow the leader, take turns and change-a-little the older sibling also performed the role of the younger sibling.

4. Coaching. Following the above procedures, the older sibling was asked to show the "new game"; either follow the leader, take turns, or change-a-little to the younger child. Three sets of toys were used in the study. Three toys sets were alternated weekly. The older sibling was given one set of toys and encouraged to begin playing with the younger sibling. The investigator sat a few feet away, coaching and frequently offering verbal praise each time the older sibling employed a SCS. Coaching was provided in the form of prompting use of a SCS with the younger sibling. Opportunities were pointed out with statements such as, "You can offer two toys and wait for (younger child's name) to choose one," or "How can you copy what (younger child's name) did?" Direct prompts instructing the older sibling exactly what to do were avoided unless interaction between siblings did not occur after indirect prompts. Verbal praise was provided continuously in early intervention sessions and intermittently during the final sessions. Comments immediately following the older sibling's use of a SCS such as "Nice, you waited for (younger child's name)," or labels such as, "You copied her clapping!" The investigator maintained a low volume voice, sitting somewhat behind and several feet from the older sibling in order not to become overly intrusive in the play sessions. Play sessions lasted 10-20 minutes.

5. Videotaping. During intervention, videotaping was conducted during the 10 minute play session described above. The camera operator was a graduate student trained in the use of video

equipment. She remained out of the direct line of vision of both children and on the other side of the play room, if possible. Videotaping began after children were engaged in interaction without any signal to the subjects. Portable equipment was used. These were a Panasonic color videocamera, model # WV3250/8AF and Panasonic videorecorder, model # AG2400. Since this equipment is lightweight, the camera operator held the camera on one shoulder while filming. An external microphone was used to maximize audio pick-up for the siblings' verbal and vocal behavior. Additional lighting was not needed due to the low-light capabilities of the camera. Each sibling dyad was videotaped six times during intervention with the exception of Dyad 4. YS 4 was extremely sleepy during the fifth session of intervention and a videotaped sample was not obtained on that day.

C. Follow-up. Following intervention, two follow-up visits were made. The first follow-up visit occurred one week after the last intervention session and the second follow-up occurred three weeks after the first follow-up. Procedures during the follow-up visits were exactly the same as those during baseline since older siblings were given no intervention during these sessions.

Design of the Study

The study proceeded in a single-subject, multiple baseline across subjects design. Three phases were included in the study, A baseline, B intervention, and A follow-up (return to baseline). Replication of an ABA design across subjects was selected to demonstrate the effectiveness of intervention with sibling dyads. A repeated effect across

subjects with similar characteristics is considered a reliable demonstration of treatment (Herson & Barlow, 1983).

Decisions regarding the length of each phase were made based on the results of a pilot study. A gradual, accelerating trend was observed in the percentage of responsive turns by the older subject, from .40 to .70, by the fourth session of intervention. Six sessions of intervention appeared necessary and adequate to demonstrate a treatment effect for the OS subjects in this study. Six different training tapes with puppets were subsequently prepared. Each OS received six sessions of intervention, Phase B, with different frequency. OS subjects in dyads 1-3 received one intervention session weekly for six weeks while OSs in Dyads 4-6 received two intervention sessions weekly for three weeks.

To summarize, Phase A: Baseline was conducted for 2-4 weeks in order to observe unstructured play of sibling dyads. After two weeks, one dyad began Phase B: Intervention. Each dyad participated in six sessions of intervention, Dyads 1-3 for six weeks and Dyads 4-6 for three weeks. Follow-up visits (return to Phase A) were conducted one week and then again at three weeks after the completion of intervention. Maintenance of the treatment effect was evaluated based on the follow-up visits. The following diagram illustrates the frequency and time for participation in the study for six sibling dyads.

Phase Length and Changes

Decisions to change phases in the study depended on the order of participation for a particular dyads. Numbers were randomly assigned to Dyads 1-6. The study began with Dyads 1-3. Dyads 4-6 began in

Baseline during week 5, when Dyad 3 began Phase B, Intervention (refer to Table 3). Additionally, a goal of .70 responsive turns for three consecutive sessions was targeted for OSs. However, this target did

Table 3. Multiple Baseline Design for Six Sibling Dyads

Weeks	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Dyad 1	A	A	B	B	B	B	B	B	A			A			
Dyad 2	A	A	A	B	B	B	B	B	B	A			A		
Dyad 3	A	A	A	A	B	B	B	B	B	B	A			A	
Dyad 4					A	A	BB	BB	BB	A			A		
Dyad 5					A	A	A	BB	BB	BB	A			A	
Dyad 6					A	A	A	A	BB	BB	BB	A			A

A - Baseline, Follow-up Sessions
B - Intervention Sessions

not affect decisions regarding phase length or changes. Each OS subject received all six presentations of SCS. Frequency of intervention was varied for two reasons. James and Egel (1986) found substantial increases in reciprocal interaction between siblings with daily intervention. Additionally, time constraints related to familys' vacation plans who were to enter late in the study made this a necessary decision.

Measurements

Several parameters of the responsiveness of OS subjects and the communication behavior of YS subjects were measured using 10-minute videotaped samples of play sessions collected throughout the study.

Videotaping was conducted in all phases of the study, unstructured play during baseline, play sessions during intervention and unstructured play during follow-up sessions.

Additional probes were videotaped at given intervals for two purposes. The first was to assess elicited comments and requests of YSs in the study. Elicitation tasks with the investigator and YSs were conducted and videotaped every third week. The second type of probe was to assess mother's responsive turns with YS without direct intervention. Mothers and YSs in Dyads 2, 4 and 5 were videotaped in unstructured play once during baseline and once during follow-up phases. Cognitive and developmental assessmentswere given to each YS subject prior to beginning the study. Procedures and measurements used are described below.

1) The percentages of responsive turns by OSs was determined using a measure developed for this study. This measure was adapted from existing literature that defines interactive turns between mother and child. Any nonverbal or verbal act directed toward another person can be defined as a turn. Kaye and Charney (1981) examined turns between mother and child and coined the terms, mand, response mand or turnabout. A mand was defined as a bid by one partner for a response from the other partner. A response followed by a mand within the same turn was called a turnabout. Garvey and Beringer (1981) examined the sequential nature of turns and boundaries between the turn of one partner and the next turn of the other partner. For this study, definitions were adapted using the above references. Five turn types

were designated including initiator, solicitation, positive response, negative response and copy.

Additionally, turns were coded as sequential, simultaneous and dominant. Only sequential turns were included in data analysis for this study. Nonverbal Turn-Taking Codes and definitions are shown in more detail in Appendix C. These five codes were used to transcribe turns by both older and younger siblings. Measures of interest in this study for OSs included a general responsiveness category and contingent responses. Turn-balance, turn-types and turnabouts were measured for older and younger siblings. Procedures for calculating these data using NTC are described.

General Responsiveness. Percentages of responsive turns by OSs were calculated in relation to total number of turns by YSs. To be considered a responsive turn, turns by OSs including Solicitation (S), Positive Response (R+) and Copy (C) were summed and calculated as follows:

$$\frac{\#\text{Total Responsive Turns by OS}}{\#\text{Total YS Turns}} = \text{Percent Responsive Turns by OS}$$

Contingent Responses. Percentage of contingent responses by OSs were calculated by counting any S, R+ or C turn that was sequential to (immediately following) the prior turn by YSs. These turns were summed and divided as follows:

$$\frac{\#\text{Total Contingent Responses (CR) by OS}}{\#\text{Total Turns by YS}} = \text{Percent CR by OS}$$

Turn Balance. Turn balance was calculated for sibling and mother-child dyads. Turns for each partner were expressed as numbers and proportions.

Turn Types. Various turn types were counted for OS and YS within play sessions. For example, the number of S, R+ and Cs were summed for each YS and averaged within phases.

Turnabouts. Turnabouts are defined by Kaye and Charney (1981) as turns containing both a response to the prior turn of the other partner and a bid for further interaction. In this study, turns containing a R+, followed by S, were considered turnabouts. These were counted in coded transcripts for OSs and reported as frequency data.

2) Measurements used to assess the effect of intervention with OSs on the communication behavior of YSs included Spontaneous Comments/Requests (Appendix D), Elicited Comments/Requests (Appendix E) and Infant Communication Modality (Appendix F). Each of these measurements will be described.

Spontaneous Comments/Requests. Intervention with OSs was intended to increase communicative opportunities for YSs. Observation of intentional communication, in the form of spontaneous comments and requests was one means of evaluating the effect of the intervention on the YSs. Definitions of comments and requests in a spontaneous setting, provided in a recent study of nonhandicapped infants by Coggins et al. (1985), were employed in this study (See Appendix D). Observers were trained to use these definitions while coding videotaped segments of play sessions collected in all phases of the study for all YSs. Rate of spontaneous comments/requests were reported.

Elicited Comments/Requests. A different means of assessing intentional communication of young children is to provide a task designed to elicit a comment or request from the child. Snyder (1978) provided several elicitation tasks designed to evaluate proto-declaratives (comments) and protoimperatives (requests) of nonhandicapped infants. These tasks were presented every third session to YSs in this study in order to evaluate the effect of intervention with OSs on the elicited communicative intents of YSs. Sophistication of comments and requests were scored. The elicitation tasks and developmental scoring criteria developed and adapted from Snyder are listed in Appendix E. Typical (means) and optimal (highest level observed) scores of elicited comments/requests were reported.

Communication Modality. Prelinguistic communication behaviors including gaze, gesture and vocalization appear to develop from single use of these behaviors to combinations of two or three with gaze being an early means of establishing interaction (Bates, 1975; Brazelton, Koswolski & Main, 1974; Bruner, 1975). Communication modality was noted according to codes 1-9, defined in Appendix F. The use of this measure was intended to assess the effect of intervention with OSs on the modality of communication behaviors of YSs. The codes were designed developmentally, that is, single communication behaviors were assigned lower numbers than combined (more sophisticated) behaviors. Typical (means) and optimal (highest level occurring) codes were reported.

3) Probes were conducted once during baseline and once during intervention with three mother-YS dyads in the study. Percentage of

responsive turns by mothers was measured using Nonverbal Turn-Taking Codes, already mentioned and defined in Appendix C. Rather than coding turns of OSs, observers coded mothers' and YSs' turns in each dyad.

4) A parent questionnaire was sent following the completion of the study to evaluate parents' perception of the intervention. The parent questionnaire is included in Appendix G.

Interobserver Reliability

Observers were trained to code videotapes using codes developed for sibling turn-taking, infant communication behaviors and mother-child turn-taking. Training for using the codes for each observational tool was conducted prior to the study. Graduate students in Special Education or related disciplines such as Speech and Hearing Sciences were hired to code data. Sample videotapes of sibling interactions not included in this study were used for training purposes. Reliability for each measure was reached through comparison of codes transcribed by independent observers. Codes were selected unsystematically for comparison. Kappa coefficients (Hollenbeck, 1978) were computed to estimate reliability for Nonverbal Turn-Taking, Infant Communication Behaviors and Elicited Comments/Requests. Percentage agreement was calculated for Spontaneous Comments/Requests.

Kappa Coefficients. Computation for Kappa coefficients followed procedures outlined by Hollenbeck (1978). The Kappa statistic is recommended by Hollenbeck in order to correct for chance agreement. When comparing continuously coded observational data by two observers, a grid is designed to calculate agreement and disagreement for each occurrence of behaviors to be coded within a defined time segment.

Agreement between observers is noted on the diagonal while disagreement falls off the diagonal, according to each observer's decision for that particular event. Resulting proportions are used to calculate Kappa with the following formula when Po signifies proportions of observed agreement and Pc signifies chance agreement.

$$\frac{Po - Pc}{1 - Pc} = \text{Kappa}$$

Kappa statistics of .60 or better are considered adequate reliability estimates, according to Hollenbeck. Reliability for observation codes calculated using the procedure described above will be discussed.

Nonverbal Turn-Taking Codes. Agreement between observers using this code was calculated by comparing transcripts made by independent observers. One observer transcribed all videotaped segments of sibling and mother-child dyads using Nonverbal Turn-Taking Codes as defined in Appendix C. Fifteen percent of the taped segments were selected at random and then coded by another trained observer. Transcripts coded by both observers were then compared on two dimensions. The first type of comparison was the number of turns coded by each observer. The first observer consistently scored more turns than the second observer, ranging from 18% to 36% with a mean of 26%. This comparison indicated that the second observer did not code as many nonverbal acts between siblings. A second type of comparison, agreement by definition of turns observed, showed more reliability.

According to time noted on transcripts, it was possible to determine when observers agreed that a turn occurred. When this happened, Kappa coefficients were calculated to determine the

reliability of codes employed. In other words, did observers agree on the definition of a particular turn-type? When both observers coded a turn for either partner in a given dyad, the code assigned was compared. Kappa coefficients for the sessions compared (.15 of total segments) ranged from .61 to .85 with a mean of .72. When observers agreed that a turn occurred, the use of codes was considered reliable.

Communication Modality. Kappa coefficients were computed for Communication Modality, shown in Appendix E. Two observers were trained to use this measure and one observer coded all segments independently. The second observer then coded 20% of segments, selected at random. This particular measure was a time-sampling measure and each observer coded a behavior every 10 seconds. Since each observer recorded the same number of behaviors, comparison was then performed only by definition of infant behavior. Kappa coefficients ranged from .42 to .85 with a mean of .69, indicating adequate reliability for this measure.

Elicited Comments/Requests. Two observers were trained to use the developmental scoring criteria as outlined by Snyder (1978) and listed in Appendix F. One observer scored all videotaped segments (24 total in number) with YSs. A second, trained observer rescored two segments for each YS (12 total or 50%). The scores assigned to each elicited comment/request ranged from 1-5 with 0 added for no response. Results obtained by both observers were compared. Kappa coefficients for agreement ranged from .52 to .80 with a mean of .66, indicating adequate reliability.

Spontaneous Comments/Requests. Three observers were trained to use definitions provided by Coggins et al. (1985) as shown in Appendix D. Videotaped segments of sibling play sessions were divided approximately in half and coded by two independent observers. A third observer randomly selected 15% of segments coded by the first two observers and recoded these segments. Percentage agreement for use of the definitions for comment and request was then computed using the formula:

$$\frac{\text{Agreements}}{\text{Agreements + Disagreements}} = \text{Percentage Agreement}$$

Percentage agreement ranged from 64 to 95 with a mean percentage of 78. In their discussion of interobserver agreement, Hersen and Barlow (1983) defined 80 as an acceptable level of agreement. The mean percent for Spontaneous Comments/Requests is slightly lower than this criteria but the range of percentage agreement found indicated acceptable level occurred in 50 of segments compared.

Trend and Level Analysis of Individually Graphed Data

Individually graphed data were analyzed to determine the existence of a reliable and meaningful treatment effect for both the older and younger siblings in this study. Single-subject data was displayed graphically so that both intra-subject comparisons across phases of the study and inter-subject comparisons could be made. In order to find a reliable treatment effect, accelerating rates of the behavior in question would be expected across all subjects during the intervention phase. For example, the responsiveness of OS 1 may show an increase in

the percentage of responsive turns during intervention but not during the baseline phase. Maintenance of high percentage in the follow-up sessions would show a continued treatment effect for OS 1. However, to be reliable, a similar increase in the percentage of responsive turns would be expected across all OSs in the study. Not only does there need to be a reliable treatment effect, but the increase must also be meaningful. The methods used to determine both reliability and meaning (or significance) of the treatment effect are taken from single-subject research literature.

White and Haring (1980) have outlined a useful method for examining both the direction or trend and level of individually graphed data. These methods were employed in this study. Trend lines were drawn to determine the direction of the data in each phase of the study, baseline, intervention and follow-up. The quarter-intersect, split middle technique was used to plot the trend line for each phase. As outlined by White and Haring, more than four data points in a particular phase are required to plot a trend line. The steps used are as follows:

1. Find the mid-date of the data series.
2. Find the mid-date of each half of the series.
3. Find the mid-rate of each half of the series.
4. Make the horizontal and vertical lines (from mid-rates and dates) in each half of the series intersect.
5. Draw a straight line connecting these intersections and extend this line through the entire phase.

6. Make a line parallel to the line in Step #5 which has an equal number of data points above and below it.

The slope of the trend line will accelerate if the behavior is increasing. Conversely, the trend line will decelerate if the behavior is decreasing. An accelerating trend is a positive change, while a decelerating trend is a negative change. The significance of the trend is related to the rate of acceleration or deceleration. An accelerating rate of x3 is generally considered to indicate a meaningful change in behavior occurred (White and Haring, 1980). Both the reliability (repeated effect) and the meaning of trends in the data were addressed in evaluating the results of this study.

Analysis of data by level in each phase was performed within and between subjects. Various methods of calculating the level of data within phases are outlined by White and Haring (1980) including calculation of mean levels. Due to the limited number of data points is each phase of this study, averages were calculated within phases and reported as mean levels. Comparisons of mean levels across phases and subjects were then made.

The significance of level changes was addressed by using a criterion point when analyzing data for OSs. White (1984) has stated (p. 88).

> If one feels that a shift in performance must be of a certain magnitude before it can be considered meaningful, then that criterion can be used in conjunction with a statistical test.

A criterion percent of .70 responsive turns for OSs was targeted in order to evaluate the significance of the treatment effect in this study. The decision for this criteria was based on the outcome of a

pilot study, already mentioned. Other investigators including Mahoney and Robenalt (1986) and Sandall (1986) have suggested 50% to be a realistic goal for turn balance with parent-child dyads. Turn balance is a quantitative measure and refers to the proportion of turns taken by each partner. A 50% figure indicates equal balance in the number of turns for both partners. Responsivity, however, is a qualitative measure and refers to the percentage of turns that are related to turns by the other partner within a dyad. A higher level than 50% responsive turns, closer to 70%, would be expected to indicate a meaningful treatment effect.

CHAPTER IV

Results

Results are presented for each question investigated in this study, beginning with responsiveness of older siblings. Observations of younger siblings' communicative behavior follow. Mothers' responsiveness and parent perception of the study are then reported.

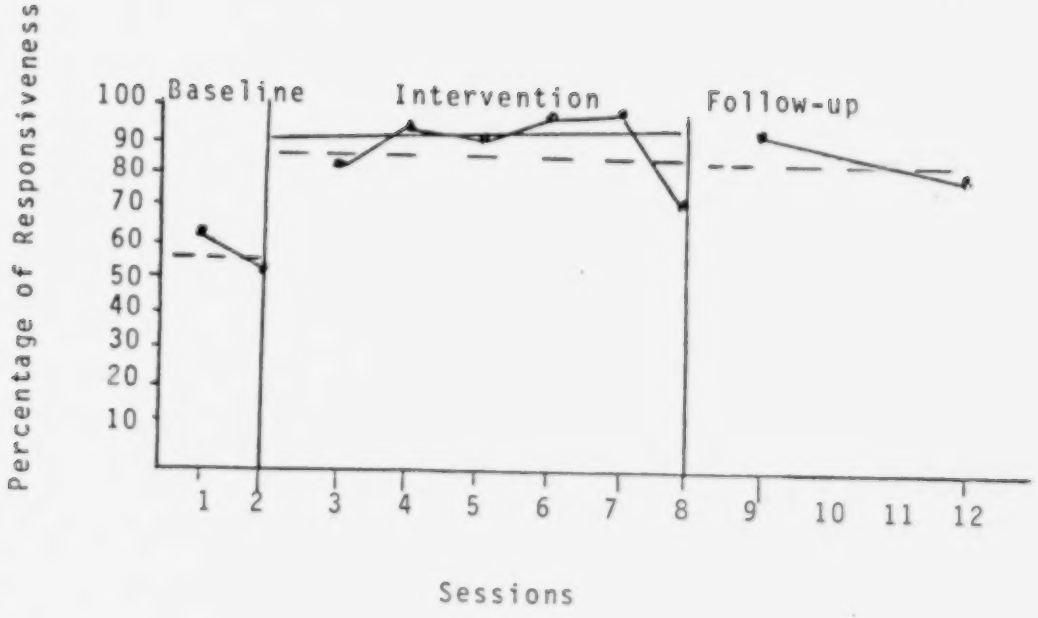
Responsiveness of Older Siblings

Responsive turns of older siblings (OSs) to younger siblings (YSs) with Down syndrome were measured in five ways. These were defined in the previous chapter and included general responsiveness, contingent responses, turn types, turn balance and turnabouts. Data for each of these measures will be presented.

General Responsiveness. General responsiveness was evaluated only for OS 1. The reason for this will be explained as the data in Figure 1 is described. Then the trend and the mean levels of the data in each phase of the study will be described.

Visual inspection shows that 61% and 51% of turns by OS 1 were generally responsive to YS 1 during baseline sessions. Percentage of general responsiveness changed during intervention, beginning at 83% in the first session of intervention, increasing to 100% by the fifth session and dropping to 71% in the sixth session of intervention. The 29% decrease in the data from the fifth to sixth intervention session was related to an event during the sixth session. YS 1 threw a container backwards, hitting OS 1. OS 1 continued the session with minimal enthusiasm. Percentage of general responsiveness increased

Figure 1 . Percentages of Responsive Turns by Older Sibling in Dyad 1. Mean levels and Trend lines have been drawn.


Percentage of Responsiveness
100
90
80
70
60
50
40
30
20
10
Baseline
Intervention
Follow-up
1
2
3
4
5
6
7
8
9
10
11
12
Sessions

again to 95% in the first follow-up session and remained at 84% in the final follow-up session. Overall, an increase of general responsiveness by OS 1 was noticeable during intervention and follow-up phases, giving support to a treatment effect.

Trend lines for general responsiveness of OS 1 could be drawn only for the intervention phase due to an insufficient number of data points in baseline and follow-up phases. The trend line showed a nearly flat slope across the phase, with only a slight increase. Variability around the trend line was minimal with the exception of data for the sixth session of intervention.

Mean levels for the baseline, intervention and follow-up phases were 56%, 89% and 89%, respectively. A change in level of 33% occurred between the baseline and intervention phases. This change in level caused OS 1 to exceed the 70% criteria for responsiveness. Maintenance of a level of 89% of general responsiveness supports a treatment effect for intervention with OS 1.

The relatively high data points seen when looking at individual sessions and mean levels for intervention and follow-up phases raised the question: Is general responsiveness the best measure of the treatment effect in this study? Data exceeded the targeted goal of 70% consistently and hovered near a ceiling of 93%, 92%, 98% and 100% in four consecutive intervention sessions. Percent of general responsiveness was measured by totaling all responsive turns by the OS and dividing by the total number of turns for the YS. Certainly, general responsiveness increased for OS 1 during the intervention phase. Those data, while supporting a treatment effect, are difficult to interpret

for two reasons. First, a ceiling effect limits the information available about a specific treatment effect. Second, the nature of the calculation indicates only that OS 1 "acted more responsively" toward YS 1 during play. For these reasons, only contingent responses were analyzed for remaining OS subjects. Contingent response data showed more specific information since only OSs' turns that immediately followed YSs' turns were counted.

Contingent Responses. Contingent responses included responsive turns by OSs that were related to and immediately followed YSs turns. Contingent response data are shown in Figure 2. Visual inspection of data, trend and mean levels across phases will be presented for each OS.

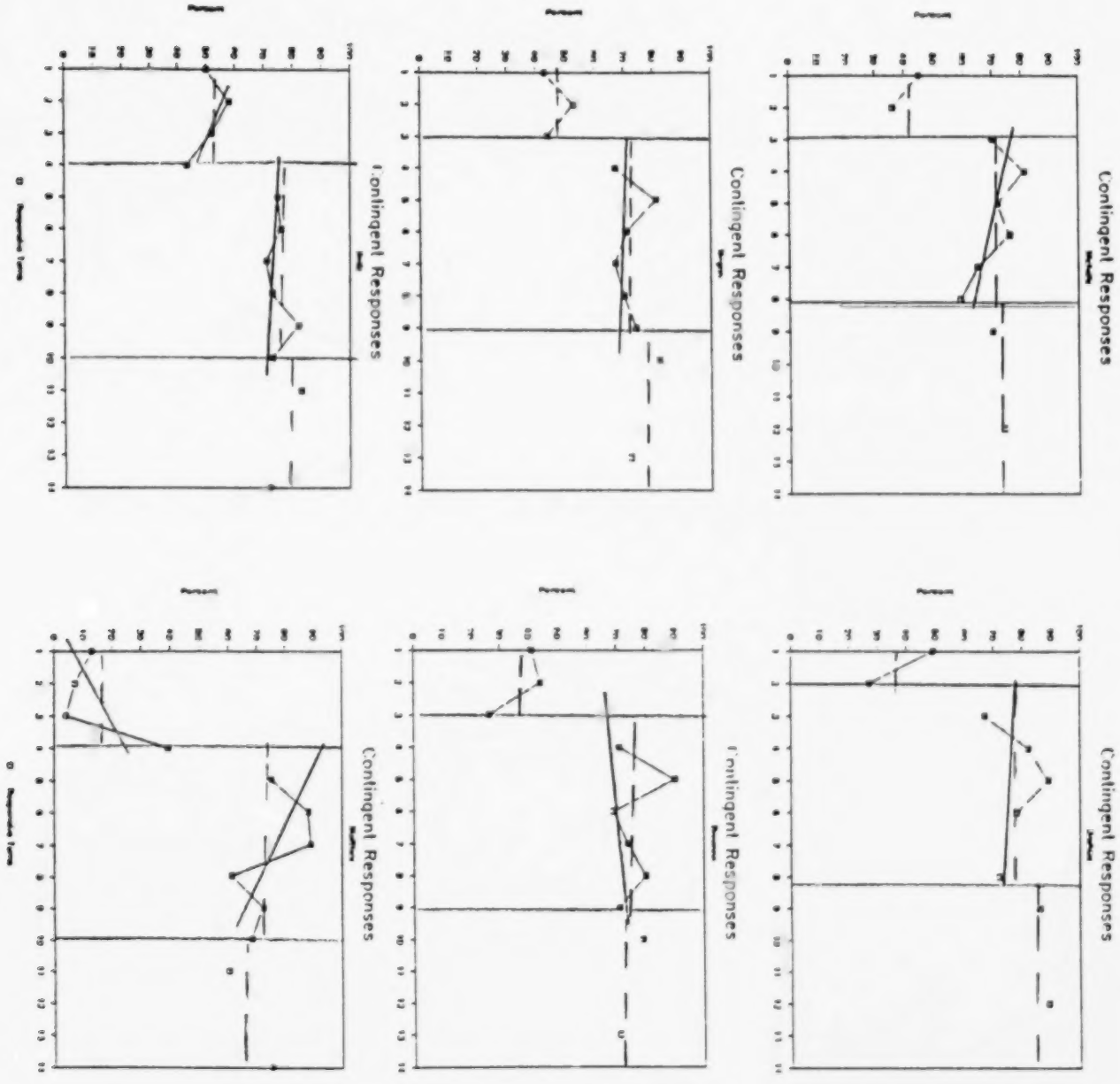
OS 1: This subject was female, age 6 years; 6 months. When analyzing contingent responses, percentages of 45 and 36 were found in the baseline phase. Contingent response increased to 70% in the first session of intervention, remaining above that point until a decrease to 65% in the fifth session and to 59% in the sixth session occurred. The decrease in the sixth session can be attributed to a temporary injury to OS 1, already mentioned. Percentage of contingent responses by OS 1 remained at 70% and above in two follow-up sessions.

Trend analysis of the intervention data showed a negative slope of the trend line, due to decreased percent of contingent response in the fifth and sixth sessions.

Examination of mean levels in all phases of the study were more informative, since a level change of 30% was seen from the baseline to intervention phase. A mean level of 72%, observed in follow-up

Figure 2 . Percentages of Contingent Responses by Older Siblings Mean levels and Trend lines have been drawn.

Percentages of Contingent Responses
by Older SIblings



sessions represents a 32% increase from baseline to follow-up and lends support to maintenance of a treatment effect.

OS 2: Baseline data for OS 2, a female, age 7 years; 10 months showed that percentages of contingent response were 43, 53 and 44. These three data points provided reliable baseline data. Changes in the intervention phase were found, ranging from 67% to 81% with minimal variability. OS 2 maintained percentages of contingent response above 70 for the final three sessions of intervention. These results support a treatment effect for OS 2 that was maintained in follow-up data.

The trend line drawn though the intervention phase showed a slight deceleration. This was related to the relatively high percentage of contingent response found (81) in the second session of intervention and the lower percents found in subsequent sessions. However, the decrease is only slight and percentages above 70 were maintained in the final three sessions of intervention and two follow-up sessions.

Mean levels of contingent response for OS 2 in the baseline, intervention and follow-up phases were 46%, 72% and 77% respectively. A level change of 25% was found between the baseline and intervention phases and a 31% level change was found between follow-up and baseline data. Level changes indicate that direct intervention was effective to increase and to maintain percentage of contingent response by OS 2.

OS 3: Baseline data for OS 3, a male age 6 years; 1 month showed little variability for 4 sessions with contingent response percentages of 50, 58, 52 and 43. Increases were observed in the intervention and follow-up phases with percentages of contingent response all above 70.

Trend lines were drawn for baseline and intervention phases, since sufficient data points were available. A decelerating slope was observed in baseline, related to the lowest percent of contingent responses by OS 3 in the fourth baseline session. The trend line for intervention is nearly flat, with a slight decrease.

Mean levels for OS 3 in baseline, intervention and follow-up phases were 51%, 75% and 77%, respectively. An increase in mean level of 24% was observed between the baseline and intervention phases. Comparison of the mean levels in baseline and follow-up phases showed a 26% increase in contingent response by OS 3. Both the increase in contingent response during intervention and maintenance in follow-up visits support a treatment effect.

OS 4: This subject was male, 8 years; 2 months of age. Baseline data were limited to two data points of 49% and 29% contingent response. An increase in percentage was seen for the first intervention session to 67%, followed by a subsequent 82% contingent response. A continued increase was observed to 89% in the fourth session, followed by a decrease to 72% in the sixth session of intervention. Follow-up data showed an increase to 86% and 89%. Percentage of contingent response by OS 4 was above 70% from the second intervention session. Increases in these percentages support a treatment effect for OS 4.

A trend line was drawn for intervention data and a slightly decelerating trend was found. Variability in the data for OS 4, from an initial 67% to a high point of 89% and a decrease to 72% contributed to negative the slope of the trend line.

Changes in mean levels of contingent response were observed from 38% during the baseline phase to 77% and 87% in the intervention and follow-up phases. An increase of 39% was found when comparing the intervention and baseline phases. A 49% increase was found when mean levels of contingent response were compared in baseline and follow-up phases. When these consistent increases are considered, the effectiveness of intervention is supported for OS 4.

OS 5: This subject was female, age 6 years; 8 months. OS 5 showed variable percentages of contingent response during the baseline phase with an overall decrease from 41%, 44% to 26% by the third week of baseline. Increases in percent of contingent response were seen in the intervention and follow-up phases beginning with 71%, increasing to 90%, decreasing to 69% and then increasing to 74%. The remaining data points were less variable, remaining above 70%.

The trend of intervention data was slightly accelerating for OS 5. Variability around the trend line was evident with a low data point of 69% to a high point of 90%. The slight increase in the trend of the data supports a continued treatment effect for OS 5.

The mean levels of 37%, 76% and 75%, across the three phases of the study showed increased mean percentages of contingent response for OS 5. Increases in mean levels of 38% were found when baseline data was compared to intervention and follow-up data.

OS 6: This subject was male, 6 years; 2 months of age. OS 6 showed considerable variability in contingent response in baseline, beginning with 13%, 7%, 4% and increasing to 39%. Intervention data showed similar variability, beginning with 75%, increasing to 88%, 89%

and decreasing to 61%. An increase to 72% was then observed, followed by a decrease to 68% in the final intervention session. Follow-up data showed continued variability with 60% and 75% contingent response. While increases were certainly observed when percentages of contingent response in baseline were compared to intervention and follow-up data, variability in baseline remains problematic.

Trend lines were drawn for baseline and intervention data. A steeply accelerating trend line in baseline was related to the increase from 4% to 39% in the third and fourth weeks of baseline. The slope of this trend line indicates that contingent responses increased for OS 6, prior to intervention. Conversely, the trend line for the intervention phase shows a steeply decreasing slope. The trend line during the intervention phase is influenced by higher percentages in the first three sessions of intervention compared to percentages in the final three sessions. The pattern of variability for OS 6 contributed to trends for baseline and intervention.

When looking at mean levels for OS 6, the results indicate a substantial treatment effect for intervention and follow-up phases. Mean levels of contingent response for the three phases were 15%, 75% and 67%, respectively. Increases in mean levels of 59% between baseline and intervention and 52% between baseline and follow-up were found. An increase of this size supports a positive change in contingent response by OS 6 that can be attributed to intervention.

To summarize results for contingent responses of OSs in this study, a repeated treatment effect was demonstrated across subjects. Contingent response increased to a level at or above 70% for all OSs

for at least three consecutive sessions. Seventy percent was the original criterion set to determine a meaningful outcome for increases in OSs' responsiveness to younger, handicapped siblings.

Presentation of individual data patterns, trend lines and mean levels of the percentage of contingent response by OSs indicated that variability was present in the data for OS 1, 4, 5 and 6. Trend lines were affected by this variability and showed deceleration for OS 1, 2, 3, 4 and 6. OS 1 and 6 showed more marked negative slope than OS 2, 3 and 4. OS 6 showed both an accelerating trend line during baseline and a decelerating trend during intervention. Trend lines for these subjects did not provide extensive support for the intervention in this study. However, nearly flat trends for OS 2, 3, 4 and slight acceleration for OS 5 indicate stable data for these subjects.

Comparison of mean levels across phases indicates a repeated and therefore reliable treatment effect. With the exception of OS 6, mean levels of contingent response met or exceeded 70% during both intervention and follow-up phases. OS 6 had mean levels of 75% and 67% contingent response. Another way to look at increases in mean levels of percent contingent response is to calculate the amount of increase. Between baseline and intervention, increases in mean levels ranged from 24% to 59% and from 26% to 52% when baseline and follow-up data are compared.

Turn types. Another analysis was performed to determine if particular turn types by YSs could account for responsiveness by OSs. Specifically, did OSs increase the frequency of contingent response to particular turn types by YSs? Two turn types of YSs were selected,

solicitations (S) and positive responses (R+). Contingent responses by OSs to these particular turn types of YSs were then counted in each session for all phases of the study. Results are shown in Figure 3.

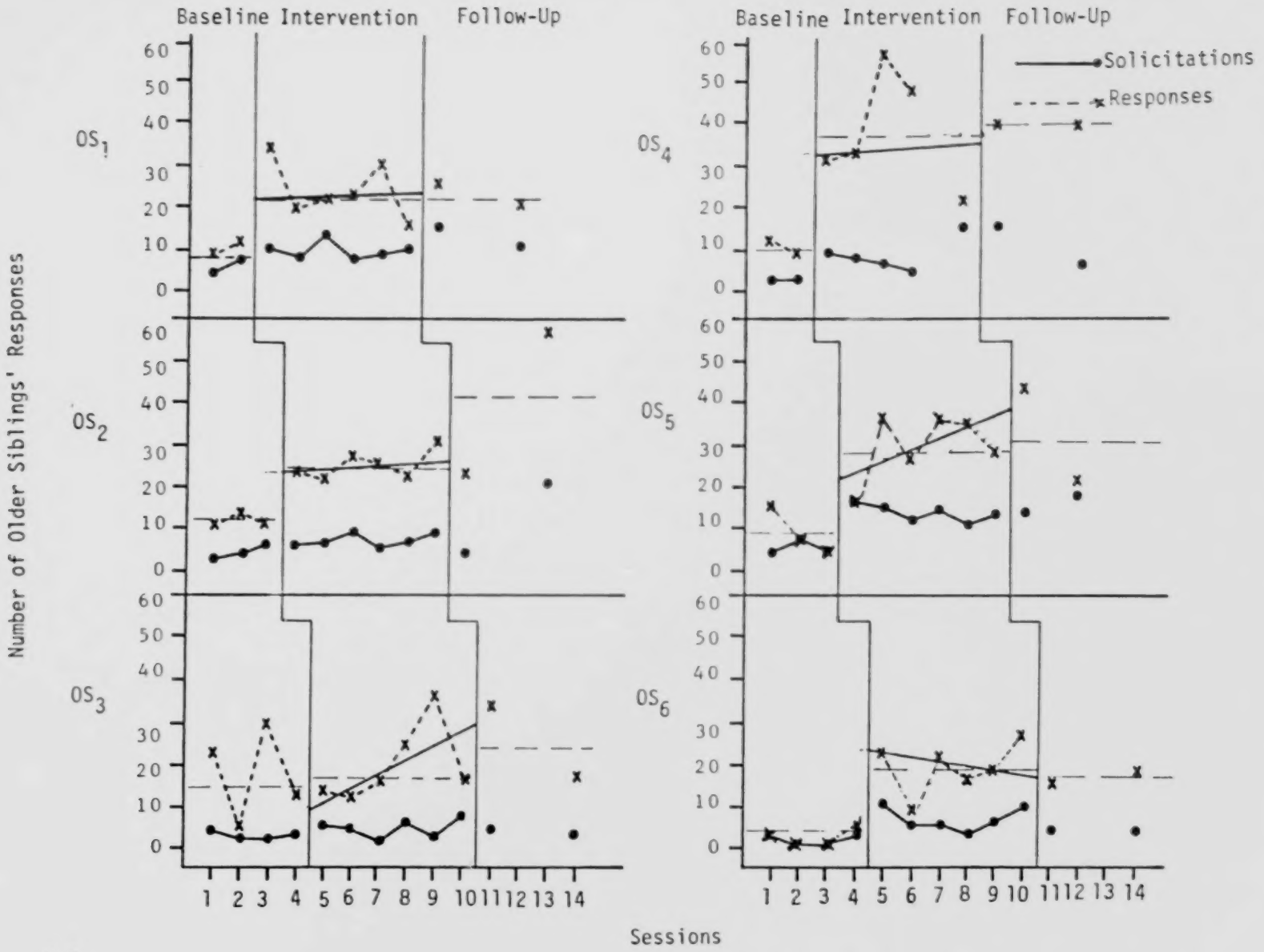
Contingent response by OSs to S turns is shown by dots connected with solid lines and response to R+ turns is shown by x's connected by broken lines. Mean levels and trend lines for R+ and S turns were drawn. Contingent response by OSs to the S and R+ turns of YSs will be discussed for all OS rather than individually.

The most apparent pattern in the data shown in Figure 3 is the difference between frequency of contingent response by OSs to YSs' R+ and S turns. OSs showed little increase in contingent response to S turns by YSs. However, contingent response by OSs to R+ turns showed an increase for five of the six Oss. Variability in baseline rates for OS 3 continued during the intervention session. Trends and mean levels of these data will be presented.

Increasing trend lines were found for OSs 1, 2, 3, 4 and 5 in response to R+ turns of YSs. Slight increases in the slope of the trend line were observed for OS 1, 2 and 4. OS 3 and 4 showed steeply accelerating trend lines. OS 6 showed a decelerating trend of contingent response to R+ turns.

Mean levels of contingent response by OSs to YSs' turn types were indicated by broken lines, drawn across phases. Baseline levels were relatively low for all OS subjects. Mean levels ranged from 3 to 16. Upward shifts in mean levels of contingent response to R+ turns were found for OS 1, 2, 4, 5 and 6. OS 3 showed little change in level.

Figure 3 . Older Siblings' Responses to Younger Siblings' Turn Types. Mean levels and Trend lines have been drawn.


Baseline Intervention Follow-Up
Baseline Intervention Follow-Up
Solicitations
Responses
OS1
OS2
OS3
OS4
OS5
OS6
Number of Older Siblings' Responses
Sessions
1 2 3 4 5 6 7 8 9 10 11 12 13 14
0 10 20 30 40 50 60

For all OSs, upward shifts in mean levels were maintained in follow-up data. Further increases in mean levels of contingent response to R+ turns were observed for OS 2 and 3 in follow-up sessions. By comparing mean levels of OSs' contingent response to R+ turns in baseline and follow-up phases, increased levels were seen for all OSs. Increases in mean levels ranged from 10 to 29. OS 2, 4 and 5 showed the largest increases with 29, 25 and 21 more responses to R+ turns when frequency were compared between baseline and follow-up.

Turn Balance. Measures of turn balance by both siblings in each dyad were made to determine changes in the numbers of turns for OSs. Turn balance was analyzed by examining numbers of turns and calculating proportion of turns for each dyad member.

Numbers of turns were reported as means for each phase in the study. Numbers of turns per session for each sibling were averaged and then compared for differences. These results are shown in Table 4. Mean numbers of turns for both siblings in each dyad are listed according to phases of the study. Differences in the mean numbers of turns between dyad members are shown at each phase. Differences for each dyad showed varying patterns of turn balance. Dyads 1 and 3 showed a similar number of turns for OSs and YSs in all phases of the study. Dyad 2 and 5 showed less turn balance since both OS 2 and 5 consistently took more turns than YS 2 and 5. Dyads 4 and 6 showed a movement away from turn balance since OS 4 and 6 increased the number of turns relative to YS 4 and 6 as the study progressed. Turn balance between siblings did not show a treatment effect in a positive direction. The number of turns either remained nearly equal for both

Table 4. Mean Numbers of Turns by Older and Younger Siblings

Sibling	Baseline		Intervention		Follow-up	
	x number of turns	diff.	x number of turns	diff.	x number of turns	diff.
Dyad 1						
Older	43	4	57	0	54	1
Younger	47		57		53	
Dyad 2						
Older	60	18	81	20	96	14
Younger	42		61		82	
Dyad 3						
Older	47	0	64	4	58	9
Younger	47		60		49	
Dyad 4						
Older	48	1	86	4	91	16
Younger	49		82		75	
Dyad 5						
Older	56	19	75	19	82	22
Younger	37		56		60	
Dyad 6						
Older	34	4	75	22	45	12
Younger	38		53		33	

dyad members, remained unequal with more turns by OSs or showed an increase in number of turns by OSs.

These same data are shown as proportions in Figure 4. When exhibited as percentages, changes in turn balance were found for Dyads 1 and 2. In Dyad 1, YS 1 took more turns than OS 1 in the baseline phase, but turn balance improved in the intervention and follow-up phase. A reverse pattern was found in Dyad 2 since OS 2 initially took 17% more turns. This difference was reduced during intervention and follow-up to a difference of 08%. Movement away from turn balance was seen in Dyads 3, 4 and 6 with OSs taking a greater proportion of turns. Little change was observed in Dyad 5 with OS 5 consistently taking 22%, 14% and 16% more turns across phases. It is possible that changes in turn balance for Dyads 1, 2, 3, 4 and 6 are in some way related to the intervention introduced to OSs. These results do not support a consistent effect to promote more equal number or proportion of turns for both dyad members. The results seen in Dyads 1 and 2 lend support to the improvement of turn balance through coaching OSs to use SCS.

Turnabouts. Turnabouts were defined in the previous chapter as turns containing both response and solicitation elements. Contingent responses of OSs that were also turnabouts were counted and are graphically displayed in Figure 5.

Visual inspection of turnabout data for OSs revealed limited changes in frequency of turnabouts when data for baseline, intervention and follow-up phases were compared. Baseline frequency was low for all OSs, under 5 for five subjects. Baseline data for OS 3 ranged from 1 to 10 turnabouts per session. Frequency of turnabouts increased for OS

Figure 4 . Proportion of Turns by Older and Younger Siblings

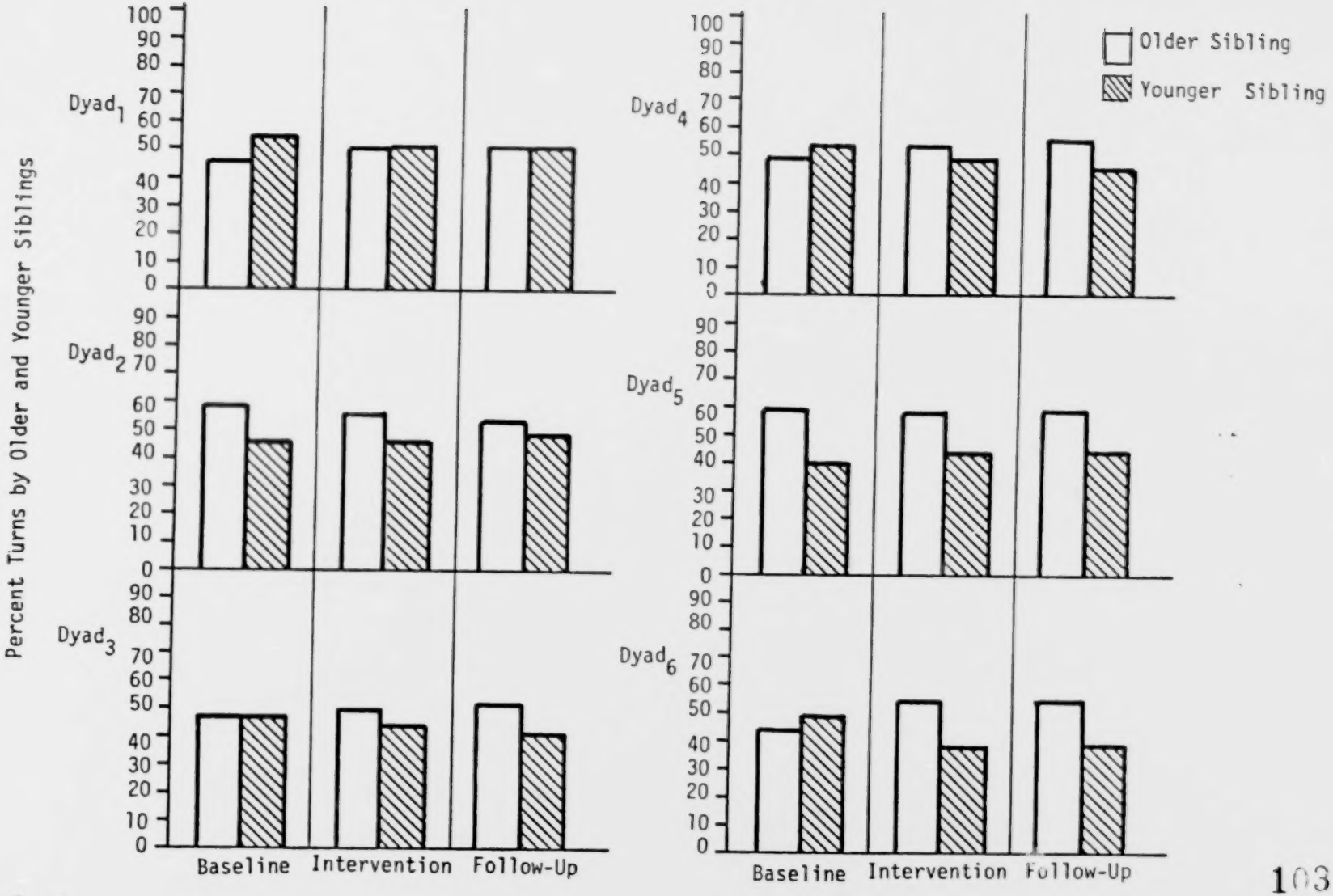
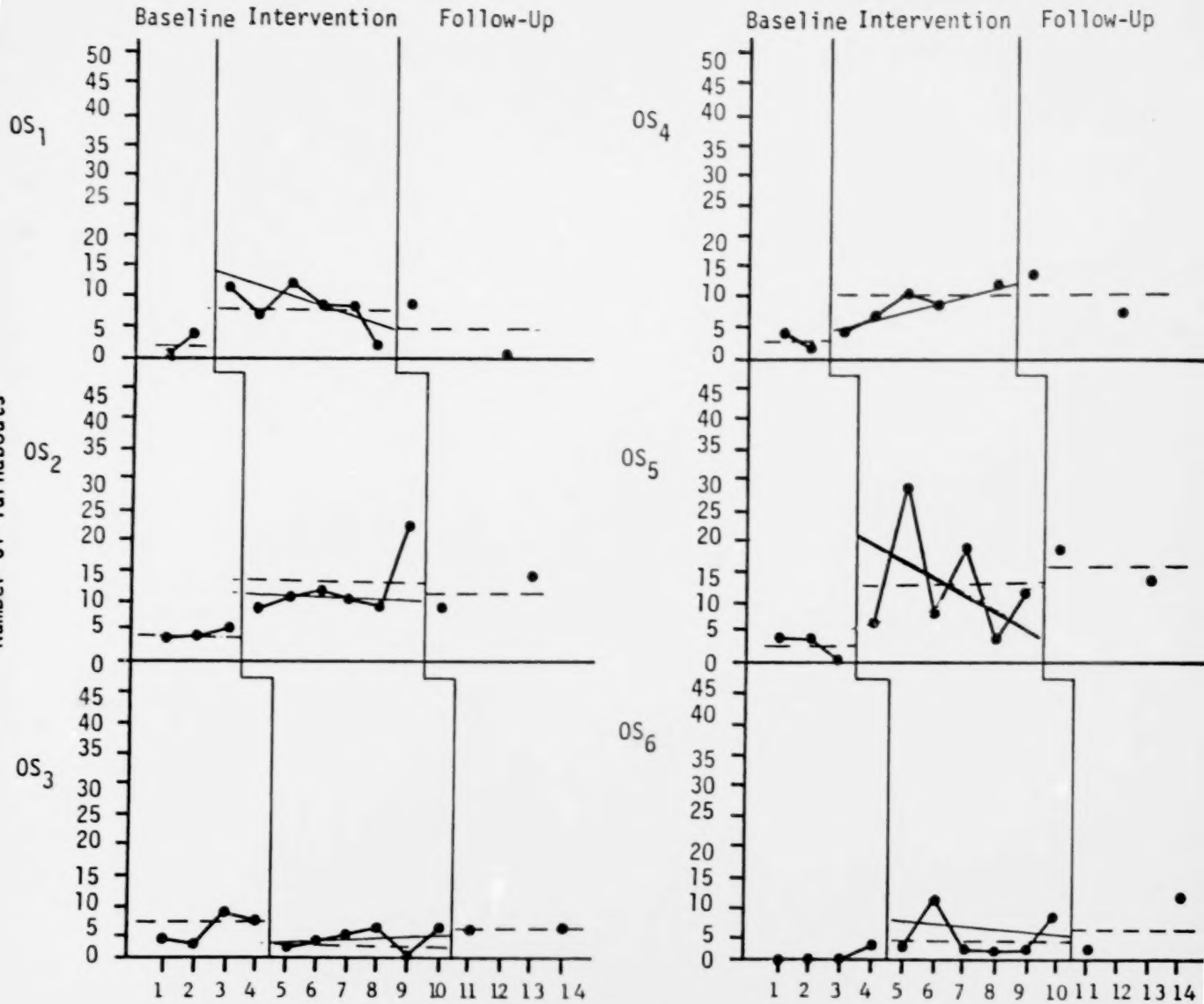

Percent Turns by Older and Younger Siblings
Older Sibling
Younger Sibling
Dyad1
Dyad2
Dyad3
Dyad4
Dyad5
Dyad6
100
90
80
70
60
50
40
30
20
10
0
Baseline
Intervention
Follow-Up

Figure 5 . Frequency of Turns-Abouts for Older Siblings Mean levels and Trend lines have been drawn.


Baseline Intervention Follow-Up
OS1
OS2
OS3
OS4
OS5
OS6
Number of Turnabouts
Sessions

1, 2, 4, 5 and 6. These increases during intervention were small in number with frequency ranging from 1 to 14 for OS 1; 9 to 23 for OS 2; 7 to 13 for OS 4; 6 to 27 for OS 5 and 2 to 11 for OS 6. OS 3 showed no increase in the frequency of turnabouts during intervention. OS 5 increased in range (6 to 27 turnabouts) and variability in the intervention phase.

Trend analysis showed a positive slope for OS 3 and 4. For OS 3, the trend line in intervention may have been a continuation of an accelerating trend observed in baseline. The accelerating trend for OS 4 showed a steep positive slope. However, there were insufficient data points in the baseline phase to compare the two phases for OS 4. Other OSs showed decelerating trends for frequency of turnabouts.

Changes in the frequency of turnabouts were found when mean levels were compared across phases for OS 1, 2, 4, 5 and 6. Changes for these OSs were not large. When mean levels of baseline and intervention frequency were compared for these five OSs, differences ranged from 4 to 14 turnabouts. For OS 2, 4, 5 and 6, these increases in mean levels were also found in follow-up phases.

Based on analysis of trend and mean levels for frequency of turnabouts, increases were observed for five OSs. When the total turns in each session were considered for OSs, the numbers representing turnabout frequency were relatively small. (Refer to Table 4 for an example of the mean number of turns for dyad members). It is difficult to determine the significance of these relatively small changes in turnabout rate. For five OSs, some treatment effect was evident.

Communication Behavior of Younger Siblings

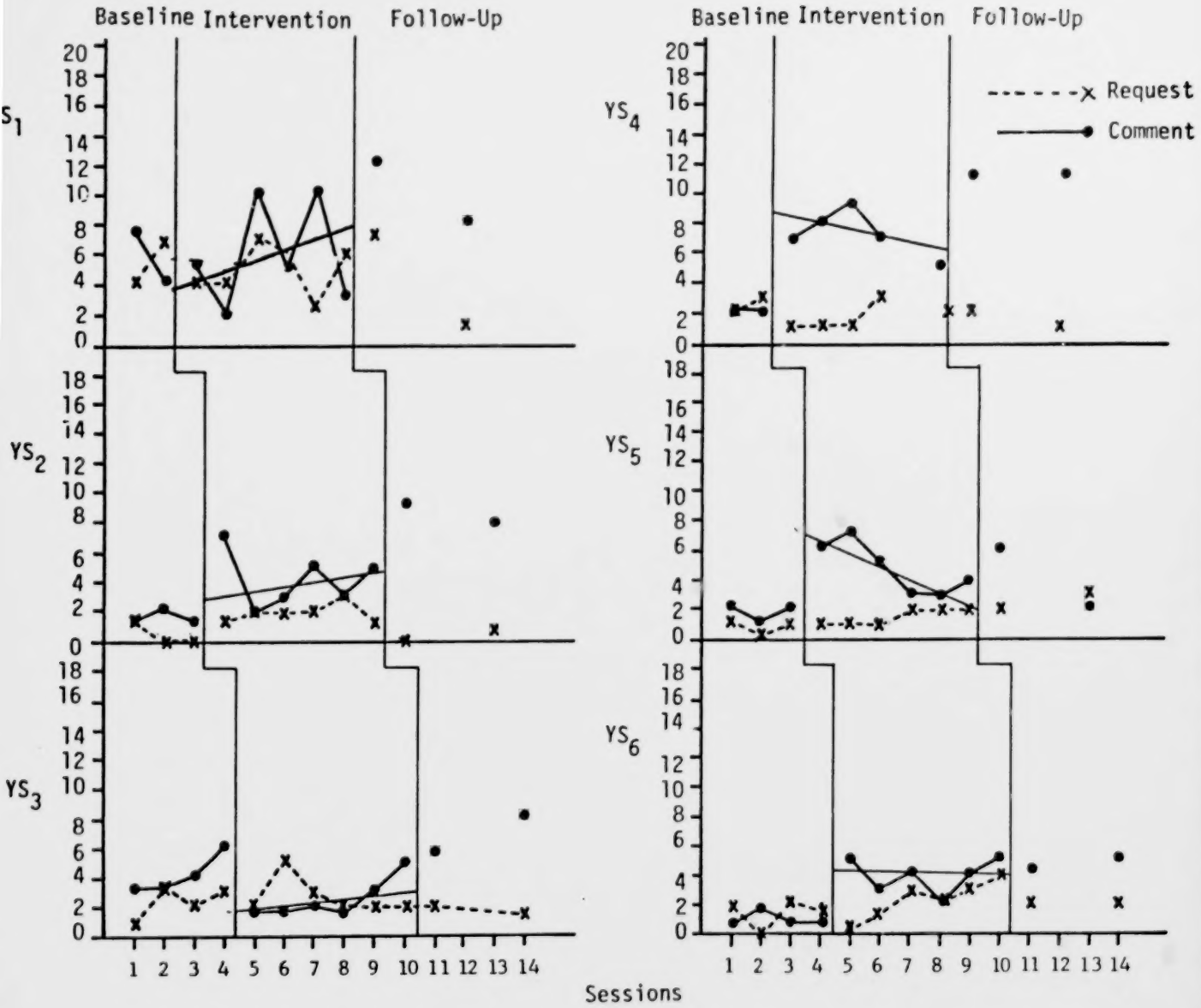
In order to determine whether the intervention had an impact on YSs, their communication behavior was analyzed. Analysis was performed on four components of communication at the prelinguistic level, spontaneous comments/requests, elicited comments/requests, communication modality and turn types. Results for each of these measures will be presented.

Spontaneous Comments/Requests. Two types of communicative intents, comments and requests, were evaluated using definitions provided by Coggins et al. (1985). Frequency of comments is shown in Figure 6. Frequency of requests is shown in Figure 7. Trend lines and mean levels were drawn. Data for comments and requests will be discussed separately.

Comments. In the baseline phase, comments were a relatively low frequency behavior for YS 2, 4, 5 and 6. YSs 1 and 3 used a greater number of comments: 7 and 4 for YS 1 and 3, 3, 4 and 6 for YS 3. In the intervention phase, increased numbers of comments were observed for YS 2, 4, 5 and 6. YS 1 showed a pattern of alternating variability that may have been a continuing pattern across phases. It is important to note that YS 3 showed a lower frequency of comments in the intervention phase than in baseline. Follow-up frequency for comments were higher than baseline rates for all YSs.

Trend analysis during the intervention phase showed accelerating trends for YS 1, 2 and 3. YS 4 and 5 showed decelerating trends in the numbers of comments per session. The slope of the trend for YS 6 was nearly flat. Trends do not support a treatment effect for all YSs.

Figure 6 . Frequency of Comments for Younger Siblings. Mean levels and trend lines have been drawn.

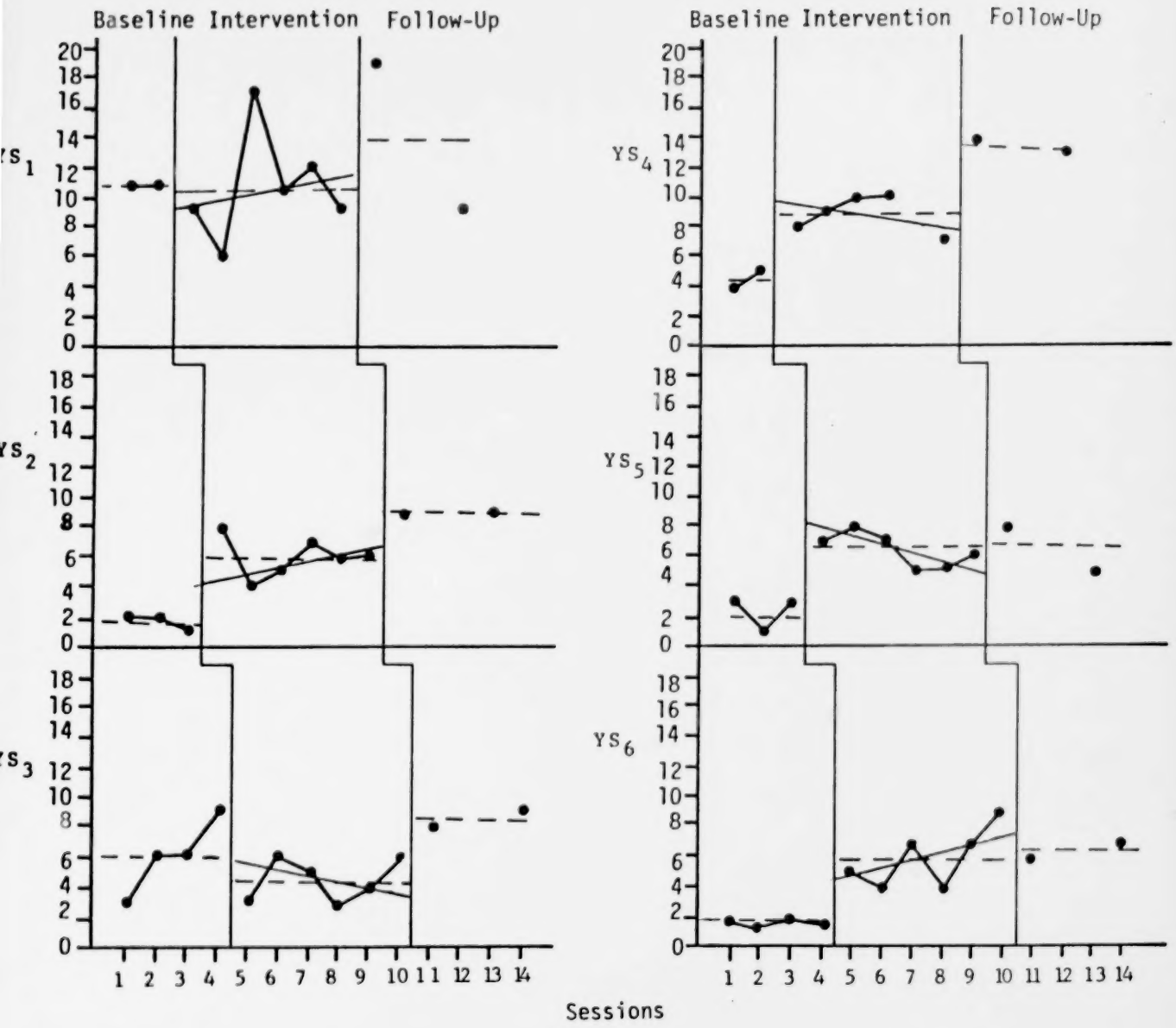

Baseline Intervention Follow-Up
Baseline Intervention Follow-Up
Request
Comment
YS1
YS2
YS3
YS4
YS5
YS6
Sessions

Mean levels of comments, on the other hand, were higher for YS 2, 4, 5 and 6 when data in baseline and intervention were compared. Mean levels of comments in follow-up phases were higher when compared to baseline for all YSs. When considering visible changes in data, trend lines and mean levels, a general pattern of increased use of comments was found. The significance of positive changes in the numbers of comments is difficult to determine related to the variability and relatively low frequency of comments. Decelerating trend lines during intervention for YS 4 and 5 may be related to the variability in numbers of comments observed. Additionally, increased mean levels of comments at two of the follow-up points for all YSs lead one to ask if these data represent a treatment effect or a developmental phenomenon.

Requests. Baseline data indicated a low frequency of requests for five of six YSs. YS 1 alone showed a number of requests in the first two sessions. Visual examination indicated little change in frequency of requests for YSs. However, slightly accelerating trends were observed for YS 4, 5 and 6. Decelerating trends were observed for YS 1 and 3. Frequency of requests for YS 3 showed a flat trend. Mean levels of request showed little change across phases except for slight changes for YS 5 and 6. Based on the results of these data, a treatment effect was not observed related to the increased use of spontaneous requests by YSs.

In addition to analyzing comments and requests separately, data for these two communicative intentions were summed. Combined frequency for comments and requests are shown in Figure 8 as frequency data for communicative intentions. Both trend lines and mean levels were drawn.

Figure 8. Combined Frequency of Communicative Turns for Younger Siblings. Mean levels and Trend lines have been drawn.


Baseline Intervention Follow-Up
YS1
YS2
YS3
YS4
YS5
YS6
Sessions

Combined frequency of communicative intentions remained relatively low during the baseline phase for YSs 2, 4, 5 and 6. YS 1 and 3 showed higher baseline frequency, 11 for YS 1 and 3 to 9 for YS 3. Increased frequency was visible during intervention for YS 1, 2, 4, 5 and 6. Trend lines support this apparent increase for YS 1, 2 and 6 since positive slopes were found. YS 4 and 5 showed decelerating trend lines. Examination of mean levels of communicative intents showed positive changes for YS 2, 4, 5 and 6. When data in the follow-up phase was compared to baseline data, increased frequency of communicative intentions were found for all YSs. Increased frequency for the use of communicative intentions were primarily influenced by increased frequency of comments, alone. The addition of request data to obtain a combined total for these communicative intentions, resulted in slightly higher mean levels. The consistent increase seen for all YSs supports a treatment effect for higher frequency of communicative intents, rather than a developmental change.

Elicited Comments/Requests. Comments and requests were elicited from YSs by the investigator as a probe measure every third session throughout the study. Elicited comments/requests for each YS were scored according to developmental criteria adapted from Snyder (1978). Criteria for both comments and requests ranged from 1 to 5 and are listed in Appendix F. Typical and optimal scores were derived for each YS from probes taken in each phase of the study. Typical scores were derived by calculating mean scores for each subject. Optimal scores represent the highest level observed in the elicited communicative intentions of YSs. These data are shown in Table 5.

Table 5. Developmental Scoring for Elicited Comments and Requests for Younger Siblings

	Baseline				Intervention				Follow-up			
	Comment		Request		Comment		Request		Comment		Request	
	T	O	T	O	T	O	T	O	T	O	T	O
YS 1	4	5	2	2	N	N	2	5	2	5	1	5
YS 2	1	1	2	3	1	1	2	3	1	1	2	3
YS 3	N	N	2	3	1	1	2	3	1	1	1	2
YS 4	1	1	1	1	1	1	2	3	1	1	2	3
YS 5	1	1	1	1	1	1	1	1	1	1	1	1
YS 6	1	1	1	1	1	1	1	1	1	1	2	4

N - no scoreable opportunities
1-5 ratings of performance for elicitation tasks (Snyder, 1978)
T - Typical (mean) Score
O - Optimal (highest) Score

Elicited comments received relatively low scores for YS 2, 3, 4, 5 and 6 in all phases of the study. These scores indicate that elicited comments consisted primarily of direct manipulation to get an adult's attention focused on an object. YS 1 had higher typical scores for elicited comments in baseline than in follow-up probes. These scores indicate that more sophisticated communicative behavior was typically observed to direct an adult's attention in baseline than in follow-up. Optimal scores remained the same for YS 1. No appreciable increase in comment scores was observed across phases for YSs. Comments were not elicited for YS 1 during intervention probes.

Requests showed more variability in typical scores for YSs. YS 1, 2 and 3 had baseline scores of 2 and 3, indicating that showing off (2) was a typical score and gesturing toward objects (3) was an optimal score for these subjects. YSs 4, 5 and 6 showed lower scores for requests during baseline. Changes in typical scores for requests were observed in intervention for YS 4 and in follow-up for YS 6. Optimal scores increased for YS 1, 4 and 6. Typical scores for requests decreased for YS 1 and 3. These data support increased sophistication of requests for YSs 1, 4 and 6. It is difficult to determine if these changes were due to intervention with OSs or represent a developmental process for these YSs.

Communication Modality. Communication behaviors of YSs were analyzed to determine the impact of the intervention on modality (i.e., gaze, gesture and vocalization) in addition to intent. Communication modality for YSs was coded as defined in Appendix E and discussed in the previous chapter. Codes assigned to communicative behaviors are displayed as typical and optimal modality codes in Table 6. Typical codes represent a mean number derived for all sessions within each phase of the study. Optimal codes are the highest observed in each phase.

The numbers shown in Table 6 represent modality of nonverbal behavior of YSs. For example, in baseline, YS 1 was assigned a typical code of 3 which indicates the use of gesture combined with gaze toward others. An optimal code of 9 was assigned to YS 1 indicating vocalization, gesture and alternating gaze toward others. YS 1 received typical codes of 3 and optimal codes of 9 across the study.

YS 6 showed a similar pattern with typical codes of 1, gazing at object or action and 2, gesturing to objects. Optimal codes for YS 6 remained consistent across phases as 6, gesture/vocalize to objects. YS 2 and 5 showed little change in typical communication modality but changed to higher optimal codes across phases. YS 3 showed variability in optimal codes across phases. YS 4 had changes in both typical and optimal communication modality. Typical codes for YS 4 changed across phases from 2, gesturing to objects to 3, gesturing to persons and finally to 4, vocalizing to objects. Optimal codes for YS 4 changed from 6 to 9, representing changes from gesture, vocalize toward objects to gesture/vocalize, alternate gaze.

To summarize the patterns of typical and optimal communication modality, three subjects, YS 2, 4 and 5, showed changes in codes assigned across phases. Since the codes represent increasing complexity in modality of nonverbal communication, these data indicate that YSs increased the use of combined gaze, gesture and vocal

Table 6. Communication Modality Scores

	Baseline		Intervention		Follow-up	
	Typical	Optimal	Typical	Optimal	Typical	Optimal
YS 1	3	9	3	9	3	9
YS 2	1	3	1	4	1	6
YS 3	2	8	2	9	2	6
YS 4	2	6	3	9	4	9
YS 5	1	4	1	6	2	6
YS 6	2	6	1	6	2	6

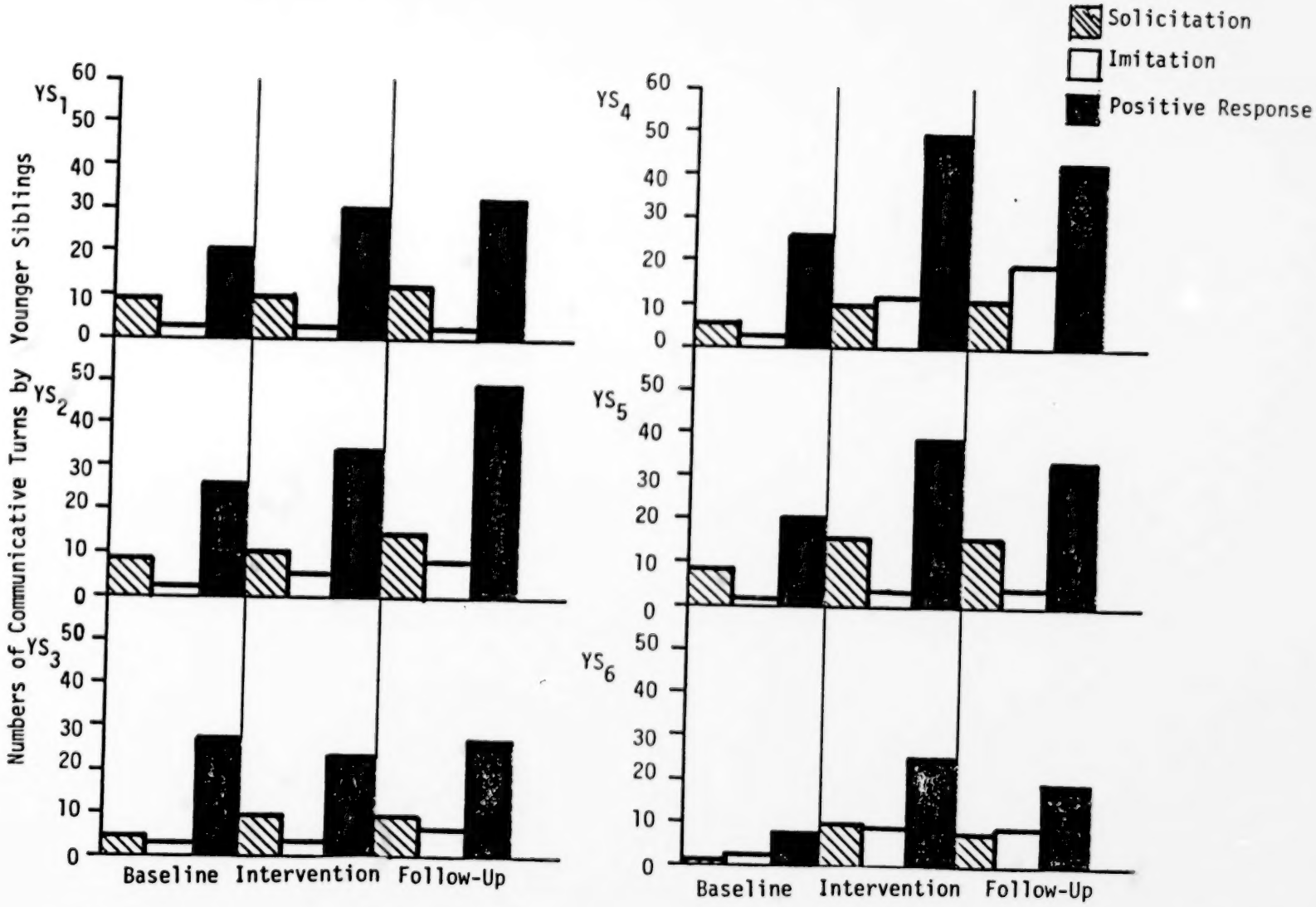
behavior. Optimal codes changed for YS 2 and 5 while increases in typical and optimal codes were observed for YS 4. These results lend support to the effectiveness of intervention with OSs to increase the complexity of communication behaviors of three YSs in this study. Because these results showed individual differences, the presence of a developmental phenomenon cannot be ruled out.

Turn Types. Turn types were examined to determine the impact of intervention on communicative turns of YSs. Turn types including solicitation (S), positive response (R+) and copy (C) were observed across phases. The mean frequency of YSs' turn types are shown in Figure 9.

Mean numbers of communicative turn types including S, R+ and C turns are shown in bar graphs for YSs in each phase of the study. Little change in numbers of S turns were observed across phases. S turns occurred at relatively low levels in baseline, ranging from 1 to 10 for YSs. Increases in numbers of S turns were found for YS 3, 4, 5 and 6 when intervention and follow-up data were examined. Mean frequency for YS 3, 4, 5 and 6 ranged from 7 to 15 S turns. Increases were minimal when differences in numbers of S turns between phases are considered.

Imitative acts represented by C turns had relatively low mean frequency for YSs in baseline. Increases were observed for YS 2, 3, 4, 5 and 6. Increases for YS 4 were larger than for other YSs. Mean frequency of C turns for YS 4 were 1.5 in baseline, 11.6 in intervention and 13.5 in follow-up. Mean frequency for R+ turns were initially higher than other turn types, ranging from 7.75 to 27.5.

Figure 9 . Mean Frequency of Turn-Types for Younger Siblings.


Solicitation
Imitation
Positive Response
Numbers of Communicative Turns by Younger Siblings
YS1
YS2
YS3
YS4
YS5
YS6
0
10
20
30
40
50
60
Baseline
Intervention
Follow-Up

Increases in mean frequency of R+ turns were observed for YS 1, 2, 4, 5 and 6. Increases in R+ turns were relatively large compared to other turn types with mean frequency in intervention ranging from 25 to 46.

Increases in YSs' turn types were relatively small for S turns and C turns with relatively large increases observed for R+ turns. All six YSs showed slight increases in S turns while four of the six used more C turns. YS 4 showed larger gains in the frequency of C turns. Four YSs had relatively large increases in R+ turns. These results support an indirect treatment effect of intervention with OSs. That is, increased numbers of R+ turns were observed by YSs. Increases in S turns and C turns were too small to detect a treatment effect.

Mothers' Responsiveness to Younger Siblings

Probes were conducted twice during the study, once in baseline and once in follow-up phases to determine percentage of mother's responsive turns to YSs. Mothers (M) of siblings in Dyas 2, 4 and 5 participated in videotaped sessions twice during the study for 10-minute periods. Three aspects of mother's responsiveness were analyzed: contingent response; turn balance; and frequency of turnabouts.

Contingent Responses. Percentage for contingent response in mother-child dyads are shown in Table 7. The percentages shown in Table 7 indicate that mothers used a high percentage of contingent response both prior to and following intervention with OSs. Mothers did not receive intervention. The percentages found for contingent response are stable and do not indicate changes related to the intervention. Percentages of contingent response are shown for OS 2, 4 and 5 from a sibling play session on the same day.

Table 7. Percentage of Contingent Response by Mothers to YSs.

Dyad		Baseline	Follow-up
2	M	.66	.72
	OS	.44	.82
4	M	.73	.75
	OS	.27	.86
5	M	.81	.77
	OS	.26	.79

M - Mother
OS - Older Sibling

Turn Balance. The frequency of turns within mother-child and sibling dyads were tabulated for comparison. These numbers are shown in Table 8. Proportions of turns for mother-child and sibling dyads were then calculated and these results appear in Figure 10. Table 8 will be discussed first. Numbers of turns for mother-child and sibling dyads in the same families are shown in Table 8. Differences in the number of turns for dyad members are shown to the right. Mothers consistently had more turns than YSs. OSs also had more turns than YSs. The mean differences in frequency of turns were calculated by summing all sessions for mother-child dyads and sibling dyads. Mean differences were 21 more turns for mothers and 16 more turns for OSs.

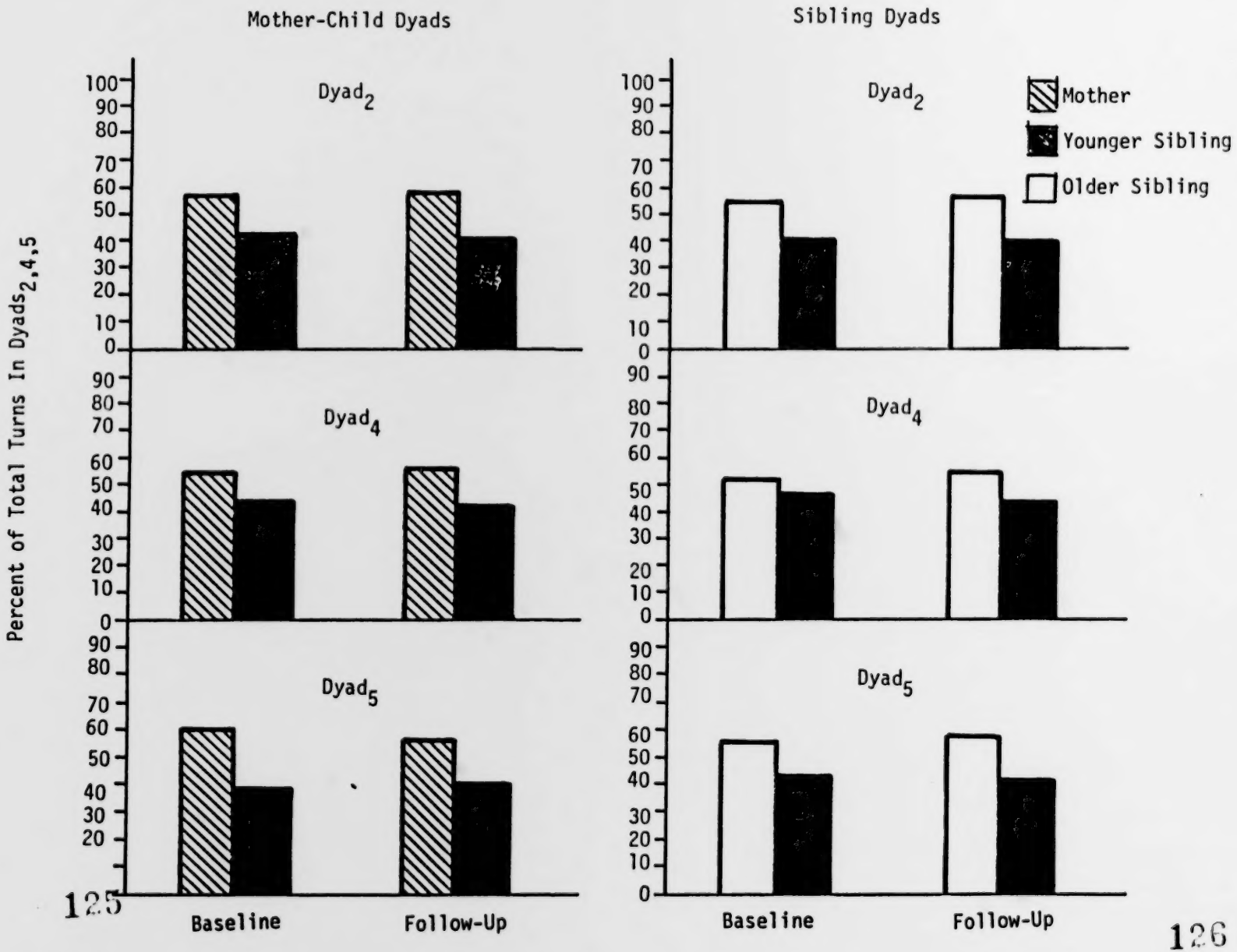
Proportions of turns for mother-child and sibling dyads are shown in Figure 10. Mothers had a greater proportion of turns than YSs ranging from 12% to 24% more turns in baseline probes and 16% to 18% more turns in follow-up probes. Changes in proportion of turns were not evident with the exception of M 5 who had closer turn balance in follow-up. A similar proportion of turns was found for sibling dyads.

Table 8. Frequencies of Turns for Mother-Child and Sibling Dyads

Dyad	Baseline	Difference	Follow-up	Difference
Dyad 2				
M	90	26	77	23
YS	64		54	
OS	65	18	80	23
YS	47		57	
Dyad 4				
M	78	15	98	26
YS	63		72	
OS	62	8	81	9
YS	55		73	
Dyad 5				
M	66	24	62	16
YS	42		46	
OS	51	14	98	26
YS	37		72	

OSs consistently had more turns than YSs. Proportions ranged from 06% to 16% more turns in baseline and follow-up probes for OSs. OSs showed closer turn balance than mothers. The range of difference for OSs was 6% to 16%, a smaller range of percentage than found in mother-child dyads.

Figure 10 . Proportion of Turn-Balance in Mother-Child and Sibling Dyads 2,4, and 5.


Mother-Child Dyads
Sibling Dyads
Percent of Total Turns In Dyads2,4,5
Dyad2
Dyad4
Dyad5
Mother
Younger Sibling
Older Sibling
Baseline
Follow-Up

Limited data were available to compare mother-child and sibling dyads. For mothers, a consistently high percentage of contingent response was observed. Similar patterns were observed in turn balance for mother-child and sibling dyads. Mothers and OSs consistently took more turns than YSs. OSs showed a closer turn balance with less proportional difference between dyad members. Since changes did not occur in mothers' percentages of contingent response or turn balance, mothers responsivity to YSs did not change as a result of intervention with OSs.

Turnabouts. Turnabouts were analyzed to determine the sophistication of mother's turns with YSs. Frequency of turnabouts used by M 2, 4 and 5 were compared to numbers of turnabouts for OS 2, 4 and 5. Table 9 shows these results. In baseline probes, mothers had more turnabouts with YSs than did OSs. However, OSs showed an increased frequency in follow-up probes. M 2 also showed an increased

Table 9. Frequency of Turnabouts for Mothers and OSs

Dyad	Baseline	Follow-up
Dyad 2		
M	5	12
OS	4	9
Dyad 4		
M	19	10
OS	4	13
Dyad 5		
M	4	6
OS	0	18

number of turnabouts, but a similar pattern was not observed for M 4 and 5. These data do not show a consistent treatment effect for mothers' frequency of turnabouts with YSs.

Parent Evaluation of the Study

Parent evaluation of the study was accomplished through a questionnaire sent and returned by mail, following the completion of the study. A copy of the questionnaire is shown in Appendix G. Parents were requested to respond to 15 statements describing sibling interaction and rate their answers from "no change," "little change," "moderate change," to "significant change." Most statements elicited the response, "moderate change." Responses ranged from "no change" to "significant change." Table 10 shows responses from parents.

Parent responses to the questionnaire showed variable ratings for individual statements. Particular items elicited a range of responses from "little change" to "significant change." Such statements included #3, #7, #9, #12 and #14. These items are stated more fully in Appendix G. Statements such as #3 (OS waits for YS), and #12 (take turns), were evaluative statements, specific to the intervention. Parents' range of responses reflected their perceptions of these skills in the repertoire of OSs. For some OSs, these particular skills may have been present prior to the intervention and a change was therefore not reported. Other items such as #4, #5, #6, #10, #13 and #15 elicited responses which were clustered around "little change"/"moderate change" or "moderate change"/"significant change." These items such as #4, (YS showing objects), #6 (joint attention), #10 (OS responds to YS) and #13 (YS communicates more) were intended to assess communication outcomes

of intervention for OS and YS. It is important to note that all parents responded that a "moderate change" occurred for item #4. Four parents also responded that "little change" occurred for joint attention for siblings (item #6). Since one intended outcome was to provide more opportunities for joint attention and communication, parental response to item #6 may indicate one aspect of communicative behavior that did not change perceptibly.

While further evaluation of such a preliminary questionnaire is needed to test for validity and reliability parental response and the significance of such responses, it appears that most statements elicited a "moderate change" response. Albeit, the intervention promoted changes in social communication strategies by OSs and subtle communication skills for YSs. Changes for both OSs and YSs may have not been readily observable without extensive explanation to parents. Generally, results of this questionnaire indicated perception of a treatment effect that was primarily rated as moderate according to predefined outcome.

Table 10. Parent Evaluation of SCS Intervention with Older Nonhandicapped Siblings

	Question	no change	little change	moderate change	significant change
1.	freq. of play	0	2	3	1
2.	enjoyment	0	2	1	3
3.	OS waiting	1	1	4	0
4.	YS showing	0	0	6	0
5.	parent relaxed	0	3	3	0
6.	joint attention	0	4	1	1
7.	parents enjoy watching	1	1	3	1
8.	OS invents games	0	2	2	2
9.	YS persists	1	1	4	0
10.	OS responds	0	2	3	1
11.	OS imitates	0	3	1	2
12.	take turns	1	0	3	2
13.	YS more communication	0	0	3	3
14.	YS initiates	1	1	2	2
15.	other family use SCS with YS	0	2	2	2
	TOTALS	5	24	40	21

CHAPTER V

Discussion

Results for each question investigated will be discussed in relation to existing literature. Then, implications of major findings for practical application and research will be presented, related to each question. Limitations of the study and conclusions to be drawn will complete this chapter.

Question 1: To what extent will older siblings exhibit responsive turns with younger handicapped siblings?

Responsivity of older, nonhandicapped siblings (OSs) to younger, handicapped siblings (YSs) was observed in the baseline phase of this study. Each dyad participated in the baseline phase for varying lengths of time, from 2 to 4 weeks. Measures of responsivity included general responsiveness, contingent responses, turn types, turn balance and turnabouts. Results of each observational measure are summarized.

General responsiveness data were analyzed only for OS 1, as explained in the previous chapter. Over half of turns by OS 1 were generally responsive to turns of YS 1 in baseline. Contingent response, for OS 1, 2, 3, 4 and 5, ranged from 32% to 51% in the baseline phase. Contingent response for OS 6 was much lower, at 15%. Low frequencies of contingent responses by OSs to turn types of YSs, including solicitation (S) turns and positive response (R+) turns were observed for all OSs. Turn balance analysis showed that OS 1, 3, 4 and 6 took nearly equal numbers of turns to Yss. OS 2 and 5 took nearly 20% more turns than YSs in baseline measures. Assessment of the

sophistication of OSs' turns (turnabouts) indicated relatively low frequency for turns with responsive and solicitation elements. Each of these findings are discussed.

In the baseline phase, analysis of general responsiveness of OS 1 and contingent responses for all OSs showed that OSs demonstrated responsive turns prior to intervention. The percentages of contingent response varied. Mean levels of contingent response in baseline ranged from 40% to 50% for OS 1, 2 and 3 and from 15% to 38% for OS 4, 5 and 6. The differences in these data have several possible explanations. One is that the siblings in the first three dyads were more accustomed to playing together than in the second three dyads. Parents of OS 1, 2 and 3 reported that these children played well together and that the older sibling helped to teach skills to the younger sibling. OS 1, 2 and 3 demonstrated responsive play skills in baseline measures.

Differences in the responsiveness of OS 4, 5 and 6 could, in part, be explained by limited quality of prior experience. Parents of OS 4 reported that all of their three older children often played with the youngest child prior to the study. However, play sessions between just two siblings did not appear to be a typical means of interaction for OS 4 and YS 4. Parents of OS 5 and 6 stated prior to the study that they wanted their older child to learn play skills to use with the younger child. For both OS 5 and 6, play sessions with YSs did not appear to be a common routine. Baseline data for OS 6 was particularly variable, beginning with very little interaction between siblings. OS 6 nearly

ignored YS 6 in the first three sessions and began to interact in the fourth session of baseline.

While not all percentages of contingent response were high, five OSs in this study responded contingently for 32% to 51% of YSs turns. The meaning of the findings discussed thus far can be determined through comparison of the present data set to interaction studies of mother-child dyads involving children with Down syndrome and studies of nonhandicapped siblings.

Studies of mothers' interaction with their Down syndrome children vary in reported findings. In a study of parents' responses to their childrens' play behaviors, Stoneman et al. (1983) found that both mothers and fathers of Down syndrome children showed more contingent responses to their children than parents of nonhandicapped children. Parents' contingent responses measured by Stoneman et al. were in response to childrens' verbal information seeking behavior. Children in the study by Stoneman et al. ranged from 4 to 7 years of age. Stoneman reported that the proportion of parents' contingent responses to children with Down syndrome was 91%. When percentages of contingent response by OSs in the present study are compared to the proportion reported by Stoneman et al., much lower percentages were observed for OSs in the present study. The implication of this comparison is that the older siblings are less responsive than parents are to younger children with Down syndrome. This finding must be interpreted cautiously for two reasons. First, siblings and parents are being compared. Secondly, children with Down syndrome in the two studies were different in ages and communication development.

Younger siblings with Down syndrome in the present study were between the ages of 16 and 41 months and communication development was observed to be at the prelinguistic/emergent language level. Buckhalt et al. (1978) and Mahoney (1975) have reported that mothers respond more to verbal than to nonverbal acts of their children with Down syndrome. Differences between the proportion of contingent response by parents observed by Stoneman et al. and percentages by older siblings in the present study may be explained by the differences in children with Down syndrome. Four YSs in the present study were essentially nonverbal while two YSs demonstrated emerging vocabulary.

Although OSs' percentages of contingent responses were lower than the proportion of parents' contingent response reported by Stoneman et al. (1983), three OSs (1-3) responded to nearly 50% of YSs' turns. Two other OSs (4 and 5) responded to nearly 40% and OS 6 responded to relatively few turns by YS 6. Consistent percentages for OS 1, 2 and 3 imply that nearly 50% of nonverbal turns of YSs were successfully responded to. Lower and more variable percentages by OS 4, 5 and 6 imply that turns of YSs 4-6 were not as successful to elicit the responsiveness of OSs. The responsiveness of older, nonhandicapped siblings to younger, handicapped siblings may vary with individual differences in both older and younger silbings.

A closer examination of the frequency of OSs' contingent responses to particular turn types of YSs in this study showed low frequencies of response to solicitation (S) turns and positive response (R+) turns. Baseline data showed that OSs responded to very few S turns (mean frequencies were below 10 for all OSs) and responses to R+ turns ranged

from 3 to 16. This finding can be interpreted to mean that OSs did not respond to initiated acts of YSs. Older siblings responded at a relatively greater magnitude when YSs responded positively to them. However, even OSs' responses to YSs' R+ turns were low frequency behaviors. With the exception of OS 3, mean frequencies of OSs' responses to YSs' R+ turns remained below 10. Baseline data for OS 3 was variable, with a mean frequency of 16 responses. These data can be interpreted to mean that older siblings responded at low frequencies to communicative turn types of YSs. Low frequencies of responses by OSs to initiated and responsive acts of YSs indicates that older siblings responded to other turn types, such as negative response (R-) turns of younger, handicapped siblings.

Comparisons of the present data set to previous research have been limited to parent-child interaction research thus far. Studies of nonhandicapped siblings offer some standard of comparison for the present findings. Abramovitch et al. (1979) observed interaction between older and younger siblings who were 1 to 3 years apart. Older siblings in the study by Abramovitch et al. were 3 and 4 years of age. Abramovitch et al. reported that siblings engaged in both prosocial and agonistic (competitive) behavior. Older siblings who were three years older engaged in somewhat more prosocial than agonistic behavior. Older siblings in the present study were 3 to 4 years apart and ranged in age from 6 to 8 years. Percentages of interaction were not reported by Abramovitch et cl., limiting comparison between the two studies. However, positive interactions between siblings were found in both studies, one of nonhandicapped sibling dyads and one of sibling dyads

with a younger, handicapped member. Percentages of older siblings' contingent responses varied in the present study, but positive responses were clearly present. Contingent responses in the present study and prosocial behavior in the study by Abramovitch et al. may only be roughly equivalent, but similarities between sibling dyads in both studies are found.

Specific results that described turn balance between OSs and YSs in this study and frequency of turnabouts offer information on sibling turn taking behavior. Turn balance varied for sibling dyads in this study. Nearly equal numbers of turns were observed for both older and younger siblings in dyads 1, 3, 4 and 6. Older siblings in dyads 2 and 5 took 18-19 more turns (nearly 20% more turns) than younger siblings. The dyads in this study more closely achieved turn balance than mothers in a study by Mahoney and Robenalt (1986). Mahoney and Robenalt reported that mothers of Down syndrome children took an average of 26 more turns than their children. Five OSs averaged 8 more turns than YSs in this study, while YS 1 took more turns than OS 1. When these data are compared, older siblings of handicapped children showed closer turn balance (more equal numbers of turns) than mothers of handicapped children.

Analysis of OSs' turnabout data showed low frequencies, meaning that OSs' responses and further solicitations of YSs' turns were limited. There are at least two possible explanations for this finding. One is that younger, handicapped siblings contribute to more incomplete turns by older siblings. When turn types of younger siblings were examined, low frequencies of "communicative turns" were

observed (solicitation, positive response and copy turns). Older siblings may have been responding to limited interactive behavior of younger siblings in baseline sessions. There is some support for this explanation in a study by Mahoney and Robenalt (1986) who observed lower frequencies of turnabouts in the interaction of mothers with Down syndrome than mothers of nonhandicapped children. Mahoney and Robenalt reported 36 turnabouts for mothers of Down syndrome children compared to 50 turnabouts for mothers of nonhandicapped children. These authors attributed this finding to characteristics of mother-child dyads introduced by lower rates of response and initiation by children with Down syndrome.

While offering support for the explanation that YSs contributed to OSs's low frequencies of turnabouts in the present study, turnabout rates reported by Mahoney and Robenalt (1986) were much higher. Frequencies of turnabouts for OSs in the present study ranged from 1 to 10. The low frequency observed in this study may be related to the nature of sibling dyads versus mother-child dyads. That is, the older siblings in this study may not have yet developed frequent use of responsive and solicitation elements in turns with their younger siblings. Both the characteristics of younger, handicapped siblings and the nature of sibling dyads may have contributed to the limited numbers of turnabouts observed in this study. Crnic and Leconte (1986) have suggested interaction patterns between "special siblings" may be different than the patterns between nonhandicapped sibling dyads. Further investigation of turn taking development in nonhandicapped sibling dyads is needed.

Question 2: Following intervention, will older siblings increase responsive turns with younger siblings?

To determine the effect of intervention, responsivity of OSs was observed in six intervention sessions and two follow-up sessions. Measurements used included observations of general responsiveness, contingent response, turn types, turn balance and turnabouts. General responsiveness was reported only for OS 1 because resulting percentages approached ceiling levels. Contingent response, a more stringent and therefore more informative measure was used for all OSs. Results for these two measures, general and contingent responses, showed a consistent and immediate treatment effect for all six OSs. Visual inspection showed a relatively large shift in percentage of contingent response from the last data point in baseline to the first data point in intervention. Comparison of mean levels showed a range of increase from 24% to 59% during intervention. Six OSs met or exceeded a target criterion of 70% for at least three consecutive sessions of intervention. Other measures showed changes in the frequency of OSs' contingent response to responsive rather than initiated turns of YSs. Turn balance, or the number and proportion of turns, showed positive changes in proportion for two siblings. Small positive changes in the number of turnabouts, or turns with responsive and solicitation elements were observed for five OSs.

These findings indicate that a consistent treatment effect was found across all OSs. In all cases, there were increases of contingent responses to younger, handicapped siblings. This finding appears directly related to the intervention and its importance should be

noted. Repeated, positive changes were observed for all OSs in this study during intervention sessions. These changes were maintained at criterion levels for five OSs in follow-up sessions. For all OSs, contingent responses at follow-up were substantially higher than baseline measures (26-52% higher). The positive changes observed in OSs' contingent responses have two major implications: Older siblings increased the proportion of turns of YSs. Not only were OSs' turns more related, but they immediately followed YSs' turns, providing contingent feedback or reinforcement to acts of YSs. The success of the Social Communication Strategy (SCS) intervention in this study has three major implications for research and application. First, the choice of contingent response as a criterion measure of sibling interaction is supported by this study and previous research. Second, these results indicate that intervention of shorter duration is possible. Third, the effectiveness of direct intervention was demonstrated with older siblings, but modifications are required for application of the model developed in this study. Each of these implications for practice and research will be discussed.

Contingent Response. Consistent and reliable increases in the percentages of contingent responses were observed for six older siblings in this study. The selection of contingent response as a primary outcome measure for this study was theoretically based. Snow and Ratner (1984), Bruner (1975) have described the importance of caregivers' contingent response to infants. The social practice of signalling caregivers and receiving immediate response contributes to future interaction. To put the notion of contingent response in

learning theory terminology, the positive reinforcement of infant signals by caregivers' responses increases the probability of continued and increased signalling from the infant. Within the context of sibling interaction, contingent response to turns by one sibling should theoretically increase the occurrence of turns by the other sibling. One effect of this intervention was an observed increase in general responsiveness. While a treatment effect of an increase in percentage of general responsiveness was observed for OS 1, this means only that OS 1 increased the percentage of turns that were directed toward the YS. Measuring contingent response, however, limited observations to turns that were related to a previous turn by YSs. This latter measure is more sensitive when compared to the measure of general responsiveness. Social communication strategies taught to OSs emphasized attention to turns of YSs (follow the leader) and subsequently copying or responding (take turns) and then continuing with slight alteration of actions (change a little). The measure employed, percentage of contingent responses, is supported as a reliable assessment of OSs' ability to apply SCS in play sessions with YSs.

Intervention with siblings to increase interaction with a handicapped sibling was measured differently by James and Egel (1986) who observed changes in reciprocal interaction. Reciprocal interaction was defined by James and Egel as an initiation by one sibling, followed by the other's response. Behavior of both siblings was included in measures of reciprocal interaction. James and Egel reported that three sibling dyads showed high levels of reciprocal interaction with averages ranging from 88% to 93% at 6 month follow-up. In the present

study, six OSs showed averages of contingent response ranging from 67% to 87% at follow-up. The differences in measures used in the two studies may account for the relatively lower percentage of contingent response. In this study, additionally, it also appears that contingent response by the nonhandicapped sibling is a more stringent measure than reciprocal interaction of both siblings. Although the two terms are quite similar, the difference between them is important. Contingent response more directly measured the effect of the intervention in this study.

A more specific analysis measured changes in OSs' contingent response to solicitations (S) turns and positive response (R+) turns of YSs'. Results showed positive changes only in response to R+ turns. Solicitation or S turns were equivalent to initiated turns by YSs. OSs in this study did not become more responsive to initiated turns by YSs. Rather, OSs became more responsive to R+ turns of YSs. Level increases for OSs' responses to R+ turns has implications for both nonhandicapped and handicapped siblings. Through training OSs to use SCS, higher frequencies of responses to YSs' initiated turns were expected. However, higher frequencies of responses to initiated turns by YSs did not occur. This finding could be, in part due to limited initiations by YSs. When YSs' turn types were evaluated, consistently low frequencies of S turns were observed, ranging from 7-15, across phases. Thus, the low frequency of the behavior may have kept the response rate of the OSs to the YSs' initiated acts at a very low frequency.

Positive changes were observed in OSs' contingent response to YSs' R+ turns. Turn type data for YSs showed increased R+ turns for five of

the YSs in this study. OSs' increased frequency of responses to R+ turns and YSs' increased frequencies of R+ turns appear related. Intervention with OSs' may have contributed to increased responsiveness for both OSs and YSs. Increased response to R+ turns defines the treatment effect further since increases were not due to initiated turns by YSs. Based on these data, it appears that SCS intervention with older, nonhandicapped siblings cannot be expected to increase older siblings' response to initiated communication by younger, handicapped siblings. Instead, responsiveness between dyad members may be expected. That is, reciprocal interaction between siblings occurred as a result of SCS intervention.

Turn balance observations showed little change as a result of intervention. Mahoney and Robenalt (1986) and Sandall (1986) have defined turn balance to be within close range of a 50:50 ratio between dyad members. Two sibling dyads achieved closer turn balance in proportion of turns for each dyad member in this study. Due to the limited number of subjects who showed changes in turn balance, only partial support for a treatment effect was found.

Turnabout data showed minimal changes for OS 2, 4, 5 and 6. The importance of this finding is difficult to determine since no comparative data for nonhandicapped sibling dyads is yet available, to this author's knowledge. Turnabouts were relatively low frequency for OSs. It is possible that low frequency of turnabouts represented typical patterns for siblings between 6 and 8 years of age. More extensive studies are necessary to develop a data base of the frequencies of

sibling, turn taking behaviors and expected frequency of turnabouts related to sibling ages.

Criterion of Contingent Response. Based on the consistent increases in contingent response by OSs observed in this study, the SCS intervention was a successful one. Criterion was set, prior to the study, at 70% contingent responses for three consecutive sessions. Five older siblings met or exceeded these criteria after six sessions of intervention. One subject (OS 2) met criterion by the first follow-up session. Four OSs met criterion in less than six sessions of intervention. For these OSs (1, 3, 4 and 6), intervention of shorter duration may have shown the same effect. In addition to the question raised regarding length of intervention, is the question of intensity. All OSs received six intervention sessions (OS 4 was videotaped for only five sessions). The intensity was manipulated, since Dyads 1-3 received weekly intervention for six weeks and Dyads 4-6 received intervention twice weekly for three weeks. Both the duration and intensity issues raised by the results of this study will be examined for their contributions to increased responsiveness of siblings as a result of this intervention.

Duration of training for OSs in this study was a predetermined amount of six sessions, based on results of a pilot study that indicated four sessions in four weeks were sufficient to reach a criterion of 70% contingent response. In the study by James and Egel (1986) older siblings of handicapped children received daily intervention until a criterion level was met. Criterion of reciprocal interaction in the study by James and Egel was determined with baseline

observations of interaction with nonhandicapped peers. In that study, the total number of sessions required for siblings to reach criterion ranged from four to eight. In this study, OS 1, 3 and 6 reached criterion after three sessions, OS 4 in four sessions and OS 5 in six sessions. OS 2 reached criterion by the first follow-up visit, but not during intervention. The use of criterion points in the two studies were somewhat different. James and Egel required their subject only to reach a predetermined percentage of reciprocal responses, while the present study required maintenance at or above a criterion point for three consecutive seeions. Based on the number of sessions required to reach a criterion in both studies, intervention can be expected to last from 3 to 8 sessions, related to individual variation in sibling performance.

Variables mentioned in studies of nonhandicapped siblings that were related to interaction between siblings included age of older siblings, age spacing between siblings and gender of older siblings (Abramovitch et al., 1979; Minnett et al., 1983; and Stewart & Marvin, 1984). In this study, older siblings were 6 to 8 years of age and 3 to 4 years older than younger siblings. Three were male and three were female. When these variables were considered with performance data, clear relationships were not apparent. That is, the oldest siblings did not reach criterion faster. Those who did were OS 1, 3 and 6, with age ranging from 6 years; 2 months to 7 years; 10 months. Two of the OSs were female and one was male. Based on the results found in this study, performance of older siblings may be expected to show individual

variability. Modifications in treatment design are needed to address individual differences in sibling performance.

An additional question was raised regarding the intensity of intervention since this varied from once weekly to twice weekly. OSs 1-3 received weekly intervention for six weeks and OSs 4-6 received twice weekly intervention for three weeks. Performance data was compared between OS 1-3 and OS 4-6. When the number of sessions required to reach criterion were compared, no consistent differences were observed. More variable data were observed for OS 4 and 5, a pattern that may be related to more frequent intervention. Criterion of performance was reached with both weekly and twice weekly sessions for OSs 1, 2, 3, 4 and 5. In this study, frequency of intervention did not show a systematic relationship to outcome. More frequent intervention may be more efficacious considering time constraints for families and professionals.

SCS Intervention. A final issue raised by these results concerns the nature of the intervention itself. Intervention in this study included modeling with puppets in a series of six videotaped segments. Instructional segments for each SCS (follow the leader, take turns and change-a-little) were presented. Each SCS was reviewed with verbal instruction, role playing and reinforced with coaching during play sessions. The treatment effect observed in intervention and follow-up data support the application of the entire "package" of intervention as described. It is unknown from these results if particular single components or combinations such as puppet modeling and coaching, may have produced the same results. Presentation and withdrawal of

particular treatment components are needed in the design of a future study to determine the relative effectiveness of particular intervention components.

A related design issue is the maintenance of the treatment effect found in this study. Maintenance of the treatment effect was observed in mean levels of percent of contingent response by OSs. Follow-up probes were performed at one week and three weeks after intervention. It cannot be predicted from these data if the treatment effect would be maintained beyond the three-week of follow-up. James and Egel (1986) reported siblings in their study maintained high levels of reciprocal interaction at six months post-intervention. A similar length of elapsed time between intervention and follow-up is needed to assess maintenance levels in this study.

Question 3: Will infants with Down Syndrome show increases in the use of intentional communication behaviors, following intervention?

Communicative behavior of YSs with Down syndrome was observed to determine if an indirect treatment effect occurred, related to SCS intervention with OSs. Several measures of communicative behavior were made including spontaneous comments/requests, elicited comments/requests, communication modality and turn types. Results showed positive changes in the rate of spontaneous comments for six YSs in the study. Elicited communication tasks indicated more sophisticated requests occurred for three YSs. Increased complexity of communication modality (gaze, gesture and vocalization) was observed for four YSs. Little change was observed in the frequency of initiated communication, but responsive turns increased for five YSs. Each of

these findings are discussed and compared to previous research. Following a discussion of each finding, implications are summarized.

In this study, only comments and requests were coded as intentional communication. Certainly, other communicative intents exist including answering, acknowledging, protesting, greeting, attention, imitation, naming, etc., as observed by Dale (1980), Coggins and Carpenter (1981) and Messick et al. (1983). Comments and requests were selected as dependent measures for this study because they represent initiated rather than responsive acts. Low frequency of both comments and requests were observed in baseline data for six YSs. Frequency of spontaneous comments increased during intervention for five YSs although variability was observed in these data. Increased frequencies of spontaneous comments were observed for six YSs in follow-up levels. Given the variability of intervention data and the relatively small magnitude of increase, mean levels in baseline and follow-up were compared. Increases in comments were observed when mean levels were compared between baseline and follow-up phases for all YSs. The meaning of these apparently small increases of comments for YSs in this study is difficult to interpret in the absence of comparative data. Coggins et al. (1985) recently reported that nonhandicapped children showed a marked increase in comments between 9 and 12 months of age. Coggins et al. did not report frequency of comments per session. Developmental ages of YSs in this study ranged from 9 to 33 months. Two of the youngest subjects with developmental ages of 9 and 17 months showed the largest increases. Positive changes in frequency of comments for these two subjects may represent a developmental

change. Smaller increases observed for the other subjects appear to be related to an indirect treatment effect of SCS intervention with OSs.

Coggins et al. (1985) also reported that nonhandicapped subjects in their study used few requests in spontaneous play. The results of this study agree with findings of Coggins et al. YSs in this study used few requests in spontaneous play sessions throughout the study. Increased communicative intents were related to higher frequency of comments. While comparable data is not available, YSs in the present study showed a pattern that is similar to nonhandicapped children in their use of comments and requests. Further, the intervention introduced to OSs contributed to increase in comments by YSs. It can be suggested from these data that increased responsivity by OSs allowed more opportunities for initiated communication by YS. Increased rates of comments by YSs in this study may have been related to developmental changes for two YSs, but this process was facilitated by SCS intervention. The meaning of these relatively small changes will require a broader data base for comparison.

Changes in elicited comments and requests were scored for sophistication rather than in frequency of occurrence. Scores ranged from "1" to "5," representing increasingly sophisticated commenting and requesting behavior. Comparison of scores elicited for comments and requests showed consistently lower scores for comments. Typical (mean) and optimal (highest) scores did not change for comments. A score of "1" was frequent, meaning that elicited comments were often restricted to direct manipulation of objects to obtain adult attention. Comments were not elicited for YS 3 during baseline or for YS 1 during

intervention. Coggins et al. (1985) reported that nonhandicapped children did not show increased use of comments in an elicitation condition until 18 months of age. Developmental ages of YS 1 and 3 were 33 months and 17 months, respectively. The developmental age of YS 3 may explain the limited quality of elicited comments. For YS 1, however, limited response to elicited comment tasks appeared related to lack of interest. Comments are not easily elicited and do not appear frequently until 18 months of age for nonhandicapped children. For YSs in this study, comments were difficult to elicit and relatively low developmental scores resulted.

Requests were more easily elicited and showed a wider range of scores than comments. Typical scores of "2" were observed at intervention probes for 4 subjects. Optimal scores increased at intervention or follow-up probes for three YSs. Upward shifts in scores indicated sequences of gesture, gaze and vocal/verbal behavior occurred. A score of "5" referred to verbal requests, observed in follow-up for YS 1. Changes for YS 6 were of similar magnitude, from "1" to "4," indicating more persistent signalling to get attention before gesturing or giving objects. The limited changes found lend partial support to the effect of SCS intervention with OSs to increase the sophistication of elicited intents, but only requests. Coggins et al. (1985) reported that requests were more easily elicited and increased markedly at 15 months of age for nonhandicapped children. Scores for elicited requests for younger, handicapped children in this study reflect a similar pattern since requests were more easily elicited and scores were generally higher than for elicited comments.

Mode of communication, rather than intent, was observed with mixed results. The changes observed in optimal scores across phases meant that these YSs used more complex behavior during interaction with OSs. Behaviors were considered communicative based on proximity and orientation toward OSs. No attempt was made to determine intent with this measure. The limited changes observed may be related to increased use of comments by YSs. When designing the communication modality codes, scores meant to represent progressively more complex signalling behavior. The three subjects with increased optimal scores also increased frequency of spontaneous comments. It can be suggested from these results that increased responsiveness by OSs led to more complex communicative behavior for these subjects. For young, developmentally delayed subjects, measureing mode of communication may detect changes in communicative behavior that are not readily detected by larger developmental milestones.

A measure of turn types provided another means for observing initiated communication behavior. YSs in this study did not show increased initiations toward OSs, a finding that supported a very recent study by Sandall (1986). Positive shifts in R+ turns were found for five YSs. Increases of relatively large magnitude were observed for four subjects. Both findings, the lack of increase in initiated turns and increased responsive turns, are important to explain the effects of SCS intervention with young, handicapped children.

Older siblings were trained to present choices of toys and then to wait for a signal from YSs. Such turns by YSs were coded as responsive, not initiated. Increased levels of responsive turns by YSs may

be related to the nature of the intervention. It is possible that responsive turns were actually "forced initiations" for YSs.

A further reason to examine the content of responsive turns of YSs is to observe the use of communicative intent. As mentioned earlier, the only intents observed in this study were comments and requests, as initiated acts. Responsive acts also contain intention. Evaluation of responsive turns to determine intention may reveal acts of answering, acknowledging, protesting, etc., by YSs.

Evaluation of differential levels of the three turn types was performed including responsive, imitative and initiated turns. Elevated numbers of responsive turns were observed that compared markedly to relatively stable rates of imitative and initiated turns. Information obtained from observations of turn types in this study may serve as comparative data for similar studies. Based on these findings, relatively large increases in responsive acts of young, handicapped children can be expected. Positive changes in initiated and imitative turns may not be observed.

The changes in communicative behavior of YSs in this study included increases in spontaneous comments, elicited requests, communication modality and responsive turns. These findings have several implications, including the need for multiple outcome measures, defining expected outcomes and determining meaningful criteria for outcome. The need for multiple measures is supported by the consistent but relatively subtle changes found in communication behavior for young, handicapped children. Positive changes in spontaneous comments and responsive turns were observed. Older nonhandicapped siblings were

taught to wait for signals from younger siblings, yet this was not successful to increase initiated acts of younger siblings. Initiated behavior may require more direct attention such as instructing older siblings to wait for particular sounds or gestures. Related to these issues is the question of determining outcome criteria. Perhaps changes in the communicative behavior of younger siblings in this study can be combined with other data sets to determine meaningful outcome.

Question 4: To what extent will mothers show systematic changes in their responsive turns to infants with Down syndrome?

Limited data were available to adequately address this question. However, probes were taken twice during the study in baseline and follow-up phases for three mother-child dyads. Mothers of siblings in Dyads 2, 4 and 5 participated in probes. No systematic changes were observed in baseline and follow-up data. Mother's responsivity to their youngest child was assessed with three measures, percentage of contingent response, turn balance and turnabouts. Not only were changes in data absent from baseline to follow-up, but data observed for three mothers were surprisingly similar. Mothers' contingent responses to young children with Down syndrome ranged from 66% to 81% at baseline and from 72% to 77% at follow-up. Turn balance was consistently unequal with mothers taking an average of 20% more turns than younger children. Turnabout data was stable for two mothers, showing little change in baseline and follow-up probes. However, one mother showed an increase of turnabouts when baseline and follow-up data were compared. Increased number of turnabouts for this mother may have been related to her observations of SCS intervention with her

children. It is possible that SCS intervention with her children may have contributed to increased turnabouts for this mother.

Because the samples of mother-child interaction were limited to three dyads with two probes for each dyad, it is important to compare these data to existing literature. The high percentages of contingent response found in baseline and follow-up probes in this study are consistent with findings by Stoneman et al. (1983) and Mahoney and Robenalt (1986) who reported mothers of Down syndrome children showed equal or better frequency of contingent response to their children when compared to parents of nonhandicapped children. Results of turn taking measures observed in this study are also supported by current literature. Mahoney and Robenalt (1986) reported mothers of children with Down syndrome took an average of 24 more turns. Mothers observed in this study took an average of 21 more turns than their children with Down syndrome. These data are compared to sibling data collected in the same families, on the same day as mother-child probes.

Contingent response in one baseline session for OS 2, 4 and 5 ranged from 26% to 44% and from 79% to 82% in a follow-up session. The difference between baseline percentages of contingent responses for mothers and OSs raises the question of mothers' systematic effect on OSs, prior to intervention. High percentages of contingent responses for both OSs and mothers were observed at follow-up. Similar percentages of contingent response might support a facilitative effect by mothers. That is, mothers' consistently high percentages of contingent response may have influenced the outcome for OSs through modeling between baseline and intervention probes. While this possible

effect cannot be ruled out, one might ask why OSs consistently demonstrated relatively lower percentages of contingent response at baseline? If mothers provided a facilitative effect to the acquisition of SCS for OSs, why did this not occur prior to the implementation of the study? Another way of examining this question is to look at individual data for OS 2, 4 and 5. A facilitative effect of mothers' responsivity to YSs is not supported for these OSs related to the consistent treatment effect observed for all three subjects.

Comparison of turn balance data between mother-child dyads and sibling dyads within the same families showed that siblings had more equal numbers and proportions of turns. Mean differences in numbers of turns showed that in mother-child dyads, mothers took more turns than older siblings in sibling dyads. Mothers took an average of 21 more turns and older siblings took an average of 16 more turns than did young, handicapped siblings. Mean proportional differences of 20% for mothers and 13% for older siblings were observed. Based on these data, more equally balanced turns were found in sibling dyads. This finding is not conclusive, related to the limited number of observations. Closer turn balance observed within sibling dyads implies that younger handicapped children have more communicative opportunities within sibling dyads than within mother-child dyads.

Turnabout data between mother-child dyads and sibling dyads were compared. Resulting increases for rates of turnabouts were observed for OSs but not consistently for mothers. Since OSs received intervention and mothers did not, it is reasonable to conclude that intervention was related to increased rates of turnabouts for OSs.

The stability of data for measures of three mothers' responsivity showed no systematic changes. Stability of percentage of contingent response, number and proportion of turn balance and frequency of turnabouts indicate that intervention had no effect on mother-child interaction. It might be hypothesized that mothers' initially high percentages of contingent response would facilitate an increased responsivity of older siblings during intervention. However, when systematic changes for six older siblings in this study are considered, it does not appear that mothers' interactive styles contributed to the treatment effect. Rather, these data imply that positive changes, meaning increased responsivity by older siblings, required direct intervention.

Question 5: How will parents perceive the outcome of intervention designed to train nonhandicapped siblings to use SCS in play sessions with younger, handicapped siblings?

Parent evaluation of the study was accomplished with a questionnaire, mailed three to four weeks following the completion of the study. Parents ranged in their responses, with most parents rating the outcome of the study a "moderate change" in the interactive play of their children. Parent perceptions could have been influenced by several factors, including the prior communication skills of the handicapped sibling, the amount of time siblings spend playing together and the cognitive level of both siblings. All parents were actively interested in the study, demonstrated by their frequent observations during intervention sessions.

The design and use of the questionnaire in this study was conceptually based on examples of self-efficacy measures, as developed by Bandura (1982). Parental perceptions of outcome for sibling intervention were important as a predictive measure. That is, if parents perceived the SCS intervention with their children as successful, continued maintenance of responsivity between siblings would be predicted. Descriptions of intended outcomes were rated by parents in one of four categories, from "no change" to "significant change." Statements describing possible outcomes elicited a range of responses but the largest percentage (66%) were rated as "moderate change."

Because of the preliminary nature of the questionnaire developed for use in this study, it is difficult to evaluate the meaning of parental response. Responsivity of older siblings in this study met or exceeded the criteria employed as a definition of meaningful outcome for this study. Positive changes in communicative behavior of younger siblings were also observed. Positive outcomes indicated by direct measures of sibling behavior lead one to expect a larger percent of parental response in the "significant change" category than observed. However, "moderate change" ratings may reflect successful intervention. The predictive value of such an instrument requires additional investigation. Correlation of individual parents' ratings with responsivity measures for older siblings at a later date would provide one validation method.

Comparison of parent perceptions and direct measures of intervention outcome showed apparent disagreement. Measures employed in this study showed meaningful increases in responsivity of OSs and more

subtle changes in communicative behavior of YS. While the particular questions used in the present evaluation instrument require further validation, parent ratings are important to gauge the external validity of intervention with siblings. Within the family context, an intervention that produced primarily moderate changes with some significant changes may indeed be considered successful. Certainly, interpretation and questionnaire validity are issues that need to be addressed. Based on the results of this questionnaire, parent evaluation is needed to measure the social validity of research and intervention outcomes with individual families.

Limitations of the Study

This study presented certain limitations in time, design and measurements that must be addressed. Each of these limitations, their impact on the study and methods for overcoming them are discussed.

The design selected for this study, a single-subject, multiple baseline was appropriate to observe the presence of a repeated treatment effect across a relatively small number of subjects. Predetermined phase lengths may have limited the flexibility of an ABA design. Subjects participated in baseline for 2-4 weeks, depending on the dyad numbers assigned. All subjects participated in 6 sessions of intervention and 2 follow-up sessions. It now appears that extended baseline and follow-up may have strengthened the study for some subjects. Initially, phase lengths were determined based on the results of a pilot study and the need to complete the study within the funding period and to meet families' schedules. For example, the baseline phase was 2-4 weeks in length, allowing intervention to begin

earlier than if baseline had been indefinitely extended to observe a stable trend.

Predetermined baseline phase lengths were not problematic for three OSs, who demonstrated relatively stable percentages of interaction with younger siblings. However, for two OSs, shortened baseline resulted in an insufficient number of data points to determine the trend of the baseline data. Even four weeks of baseline were insufficient to determine a reliable trend for OS 6, due to variable percentage of contingent response. Additional baseline sessions for these subjects would have allowed further examination of a baseline trend.

While extended baseline sessions may have been desirable, this may not be feasible in studies with older siblings of similar ages to the subjects in this study. Even with relatively short baseline phases, older siblings appeared impatient with baseline sessions, asking frequently, "is the time up yet?" when playing together. This behavior did not occur during the intervention sessions. Interventions with smaller numbers of subjects, perhaps three sibling dyads may be more feasible for the use of extended baseline.

Intervention was continued for six sessions, for all subjects. Frequency of intervention was varied with no apparent effect on the study outcome. However, six intervention sessions were not necessary for all subjects. Three older siblings reached criterion in fewer sessions. Modification in this design is needed to address individual differences in performance of older siblings. Withdrawal of intervention following a criterion point, such as 70% for three

consecutive sessions, is one method to adjust the length of intervention to meeting individual variables.

Follow-up visits were made at one and three weeks following the intervention phase. Two follow-up visits in a relatively short period of time after intervention were initially considered an adequate measure. However, James and Egel (1986) reported follow-up data at six months after intervention. All older siblings in this study maintained increased percentages of contingent responses at follow-up. Five were above criterion while one subject dropped slightly below criterion. Short-term such as used in the present study may be predictive of long-term maintenance. Follow-up at longer intervals is needed to determine if this is the case.

Another design limitation was the implementation of a complete intervention package with several mediums of teaching. Treatment effects related to intervention can only be viewed as a whole, in this study. It is reasonable to ask if less intensive intervention would produce the same effect as observed in the present study. Modifications in intervention design with the introduction and withdrawal of single or combined intervention components are recommended by Rusch and Kazdin (1981). Determination of effective but less intensive interventions would increase the applicability of SCS intervention for siblings of handicapped children and other family members.

Assessments were administered to younger subjects prior to the study in order to identify cognitive and developmental characteristics. These assessments, the Bayley Scales of Infant Development (BSID) (Bayley, 1969) and the Ordinal Scales of Psychological Development

(OSPD) (Uzgiris & Hunt, 1975) are appropriate for children up to 36 months of age. Originally, age criteria for younger siblings in this study were between 12 and 36 months of age. The age criteria were modified to include an adequate number of subjects and consequently, three younger siblings were over 36 months of age, from 37-41 months. Assessments instruments selected were not reliable for subjects approaching developmental levels of 36 months. While this limitation did not pose a serious problem for the outcome of this study, it was difficult to reliably identify developmental characteristics of these younger subjects prior to the study. Additional observations of communication behavior prior to the study provided descriptive information of younger subjects with Down syndrome. Descriptors of subjects are important for replicability of studies employing a single-subject design. Given the limited reliability of the two standardized assessments for three subjects, descriptors of communication development were appropriate to supplement developmental ages and cognitive stages. In future studies, evaluation of communication and play skills prior to the study may provide more functional information for replicating and generalizing findings reported here. One such assessment, the Play Assessment (Fewell, 1985), may be appropriate to obtain descriptions of play behaviors that are correlated to early communication and cognitive skills (McCune-Nicolich, 1982).

Communication behavior of younger siblings was assessed during the study to determine changes that were related to SCS intervention with older siblings. Two measures spontaneous comments/requests (adapted

from Coggins et al., 1985) and elicited comments/requests (adopted from Snyder, 1978) require further study and modification for use with handicapped children.

Spontaneous communicative intents were observed using a measure adapted from Coggins et al. (1985), spontaneous/comments requests. Coggins et al. reported percentage agreement of 82% when definitions of comments and requests were applied to nonhandicapped children. In this study, coders reached 78% agreement when applying the same definitions to children with Down syndrome. The lower reliability percentage by coders in this study than compared to the percentage in the study by Coggins et al. may mean that the definitions are more appropriate for nonhandicapped children. Comments and requests of Down syndrome children in this study were relatively brief and less persistent than definitions of these same behaviors for nonhandicapped children. Modification of comment and request definitions are needed for application to future studies of this population.

A measure of elicited comments/requests was adapted from Snyder (1978). Responses to elicitation tasks as presented were generally scored low. Comments were scored as "1" for five younger siblings and request scores ranged from "2" to "5". One younger sibling received scores of "1" for requests also. Comments were particularly difficult to elicit, a finding that was also reported by Smith and von Tetzchner (1986). Young children with Down syndrome exhibited fewer elicited comments than nonhandicapped counterparts, even when matched by developmental age (Smith and von Tetzchner). In the present study, comments were elicited, but the scores as reported are not very

descriptive. A downward modification of Snyder's scoring criteria may be appropriate to detect more subtle gaze, gesture and vocal behaviors observed in children with Down syndrome.

An additional measurement limitation of the present study was the extensive use of videotaping and coding required. While important to provide descriptions of sibling interaction and to observe the effect of SCS intervention in this study, practical application and replicability may be limited by the extensive videotaped sampling methods used in the present study.

Early intervention program staff may not be able to provide the equipment, staff, travel and time needed to collect and analyze videotaped data. Likewise, researchers may not be able to fund projects such as this one. In order to overcome this limitation, the development of alternative measurement methods should be explored. Two such alternatives are suggested. The first is less videotaping. Periodic probes, perhaps every third session may offer sufficient data to determine the effectiveness of intervention to increase sibling responsiveness. Another method is the development of paper and pencil checklists. Checklists to be used while observing sibling interaction in baseline, intervention and follow-up could be developed. Data obtained with such a paper and pencil measures could then be compared to information obtained from videotaped observations that require extensive coding. Related to the resulting reliability of checklists versus coding from videotapes, sibling intervention may be more efficacious.

Summary and Future Directions

In this study, an intervention designed to coach six older, nonhandicapped siblings to use SCS in play interactions with younger, handicapped siblings showed a consistent treatment effect that was maintained at follow-up. In addition to increased responsiveness of older siblings, increases in the communicative behavior of younger siblings were observed. James and Egel (1986) reported substantial increases in percentage of reciprocal interaction as a result of intervention with three older siblings of handicapped children. In the present study, measures of responsivity by older siblings and communication behavior of younger siblings allowed more specific examination of treatment effects for both siblings. Responsivity of older siblings was measured primarily as contingent response to younger siblings. Measures of communication behavior of younger siblings included observations of intent and mode of communication.

Information obtained from the results of this study are important for at least five reasons. The first is the descriptive nature of baseline data regarding sibling interaction when the younger one is handicapped. Secondly, direct intervention consistently promoted increased responsivity of older siblings. Third, a second order effect of intervention served to increase the communicative behavior of younger, handicapped siblings. Fourth, these data contribute to decisions for future research design and intervention with siblings. Fifth, for practical application, this intervention requires modification to reduce time and expense. Conclusions to be drawn from the

main findings in this study are presented. Future research questions are proposed.

Examination of baseline data revealed patterns of responsivity for six older siblings of handicapped children. Five older siblings responded to nearly half of turns by younger siblings in baseline measures. OS 6 was much less responsive, but an increase was observed after three sessions. In addition to responsiveness, four older siblings showed relatively equal numbers of turns to younger siblings. In contrast to indications of responsivity by older siblings, low frequency of response to younger siblings' initiations were observed. Also, sophistication of older siblings' turns was limited, determined by the low frequency of turnabouts observed. Five older siblings of handicapped children demonstrated positive responses in nearly half of their turns with younger, handicapped siblings. Prosocial interaction is also described in studies of nonhandicapped siblings. Older siblings of handicapped children, or "special siblings" showed similarities in their interactions to siblings of nonhandicapped children. Some specific differences are suggested in the interaction patterns of "special siblings." That is, older nonhandicapped siblings showed few responses to initiated acts of younger, handicapped siblings and used few turnabouts in their interactions. Comparative data of nonhandicapped siblings are needed to investigate the following questions: What differences are found between turntaking of nonhandicapped sibling dyads when compared to nonhandicapped siblings? Specifically, do older siblings of handicapped children respond to

fewer initiations and exhibit fewer turnabouts than older siblings of nonhandicapped children?

Intervention in this study was effective to increase contingent responses of older siblings to younger handicapped siblings. How ever, response to specific turn types did not show increased response to initiated turns of younger siblings. Rather, older siblings became more responsive to positive responses of younger siblings. A related finding was that younger siblings did not increase initiated turns as a result of intervention with older siblings. Limited response by older siblings to initiated turns of younger siblings is related to the low frequency of initiated behavior on the part of younger siblings. SCS intervention with older siblings promoted increased response to responsive turns of younger siblings. This intervention directed the attention of older siblings to behavior of younger siblings and taught responsive strategies. The consistent treatment effect was maintained at follow-up for six older siblings in this study. James and Egel (1986) reported maintenance of treatment effects at 6 months. Follow-up data at 6 months post-intervention are needed to determine the effectiveness of SCS intervention over time. The following research question is proposed: Will long range follow-up data at 6 months support a continued treatment effect of SCS intervention for older siblings of handicapped children?

SCS intervention in this study contributed to increased communicative behavior of younger siblings with Down syndrome. Increased mean levels of comments were observed at follow-up for six younger siblings. Changes were not of the same magnitude for all

younger siblings but the consistency of this finding supports a treatment effect rather than a developmental phenomenon. Increased frequency of responsive turns were observed with no apparent increase in initiated turns by YSs. This finding may be partly related to the intervention. Older siblings provided choices of toys, rather than waiting for initiated turns by younger siblings. Elicited intentions showed slight changes in scores for requests of three young siblings. SCS intervention increased the percentage of contingent response of older siblings. In turn, younger siblings responded to increased opportunities to communicate. Increased communication of younger siblings was observed in higher frequency of spontaneous comments and more response to turns by older siblings. Increased responsivity is functionally important within sibling dyads, contributing to ongoing interaction and practice opportunities to develop communication skills for younger, handicapped children. The following hypotheses were supported in this study and require further support in replication studies with different populations of young, handicapped children: SCS intervention directed to older siblings will affect communicative behavior of younger, handicapped siblings in a positive direction. Specific outcomes to be expected for younger siblings are increased spontaneous comments, responsive intentional communication and more complexity in the modality of communication observed.

The effectiveness of intervention demonstrated in this study raised the question, how much intervention is really needed? Individual differences were found regarding the number of sessions required to reach criterion levels, varying from 3 to 6 for older

siblings in this study. Age and gender of older siblings were apparently not related to duration of intervention required to reach criteria. The need for variable length of intervention was discussed. Withdrawal of intervention when older siblings reach criteria, with ongoing observation and reinstatement if necessary would address individual differences. Three older siblings in this study received intervention twice weekly. Increased frequency of intervention showed no systematic relationship to the time required to reach criteria. Interventions of increased frequency resulted in similar outcomes for older siblings. Considerations of duration and frequency of intervention support the following hypothesis: SCS intervention of increased frequency and variable duration, related to a criterion measure, will result in treatment effects similar to those observed in the present study.

Application of the intervention model developed for this study with older siblings will require further research and modification prior to dissemination. Certainly, the effectiveness of the intervention as developed supports the application to interactions involving young children with special needs and their family members. Increased responsiveness and communication of both older siblings and their younger, handicapped siblings found in this study may have potential as a means of increasing the amount and quality of interaction between "special siblings". Several considerations and modifications require further study. First, the intervention in its present form is time consuming to implement and costly to measure. Investigation of particular components of the intervention is needed,

to determine a minimal level of intervention with the same outcome. Secondly, economical measures, such as periodic videotaping supplemented with checklists, require development. Finally, parent perceptions of outcome need to be addressed. Development of SCS intervention to be implemented by parents, with professional consultation, is one way to include parents and to increase their knowledge of interactive behaviors between siblings when one is handicapped. A series of research questions need to be addressed in order to develop an economical SCS intervention for families with handicapped children. These are as follows: 1) What is the minimal level of intervention needed to produce a meaningful treatment effect for siblings when one is handicapped? 2) Do pencil and paper checklists correlate highly with videotaped observations of sibling interaction and communication behavior? 3) Using a prepared SCS intervention, are meaningful treatment effects observed for siblings when the intervention is parent-implemented?

Implementation of an intervention intended to increase responsiveness of older siblings to younger, handicapped siblings produced positive effects. Older siblings consistently increased contingent responses to younger siblings' nonverbal turns. A second order effect occurred. Increased communication behavior resulted for younger siblings. These findings are important because they demonstrate that sibling interaction can be changed with systematic intervention. Intervention with siblings within families requires individualized frequency, duration and long-term follow-up. Further investigation of SCS intervention with special siblings is needed to determine the appropriate level and the long term effects of such interventions.

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